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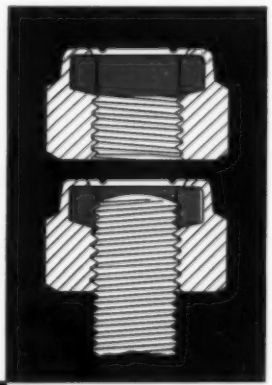

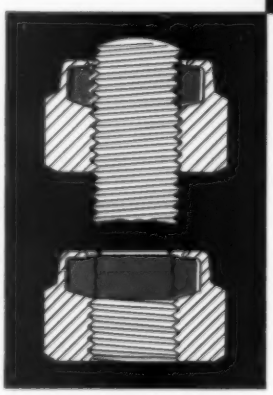

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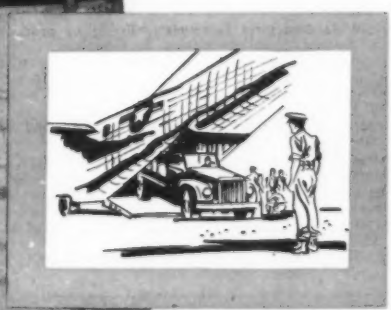

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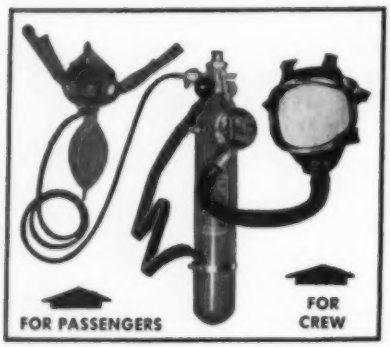

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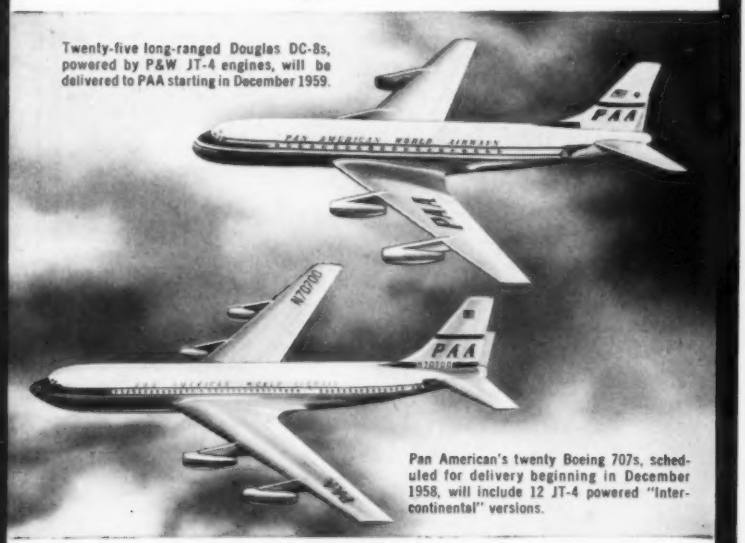
Pan American to use SKYDROL in first U. S. jet liners



Twenty-five long-ranged Douglas DC-8s, powered by P&W JT-4 engines, will be delivered to PAA starting in December 1959.

Pan American's twenty Boeing 707s, scheduled for delivery beginning in December 1958, will include 12 JT-4 powered "Intercontinental" versions.

Typical flight times for both the Douglas DC-8 and the Boeing "Intercontinental" will be New York-London in 6 hours, 15 minutes; Tokyo-Seattle in 8 hours, 32 minutes.

Pan American's mammoth order for 25 Douglas and 20 Boeing commercial jets is the largest aircraft order ever placed by a private company . . . the first firm purchase of jets ever made by a U. S. airline. And Pan American recognizes that the jet age is also an age of high-performing synthetic lubricants. The company has specified fire-resistant Skydrol fluids to be used in the hydraulic systems of both types of aircraft.

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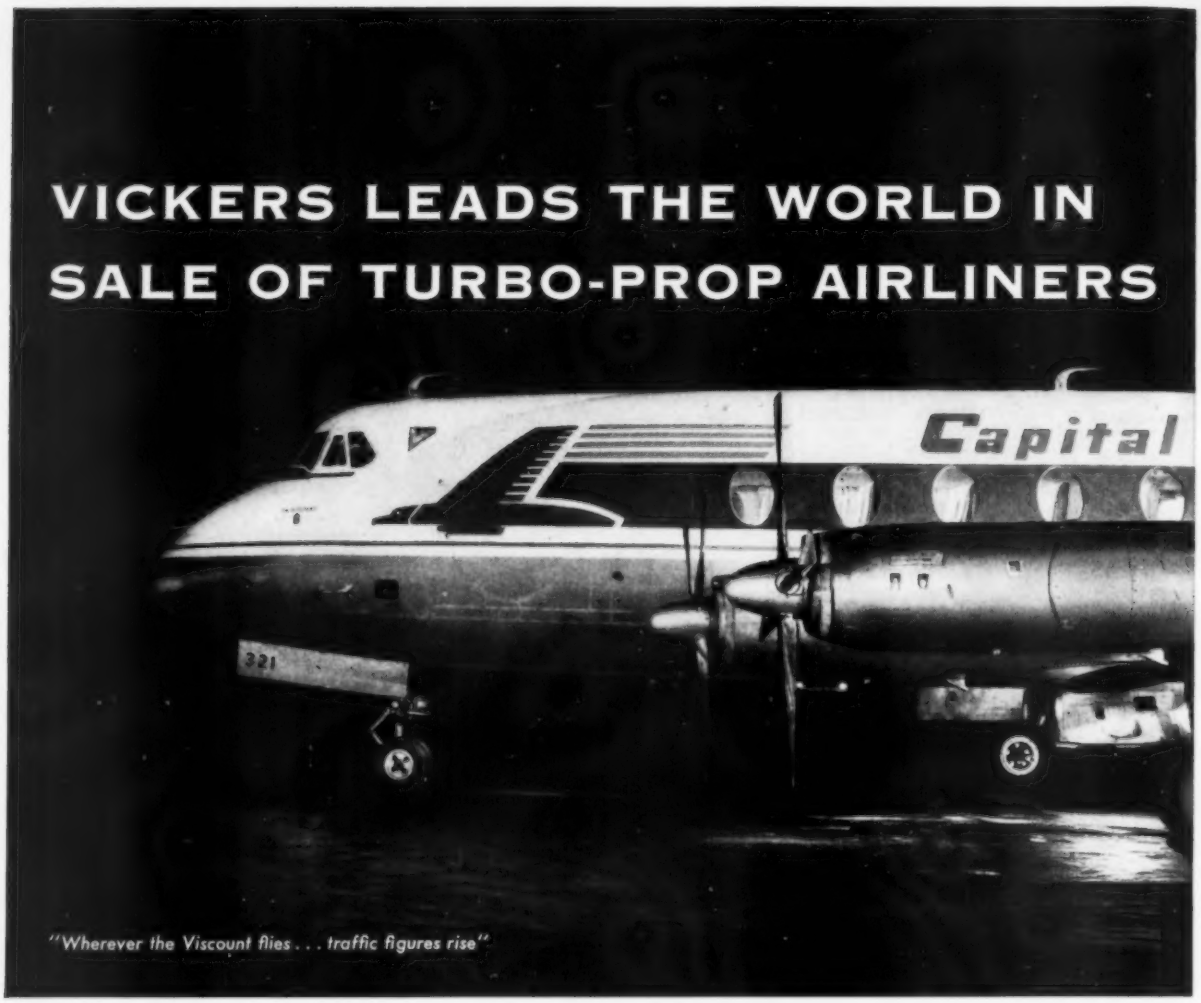

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Personal View

By WAYNE W. PARRISH

Symington is Spinning a Taut Web

IT HAS BEEN six years since Stuart Symington was Secretary of the Air Force. But a good case can be made he's been a more powerful force on behalf of air power during the past year than anyone in the present top civilian command at the Pentagon.

Ever since he became Senator from Missouri in 1952 it was assumed that Symington would be a strong air power advocate in Congress. But even he probably didn't expect to be in a position in 1956 of putting and keeping the Administration on the defensive and forcing an extensive series of air power decisions.

At first there were many who considered Symington to be a sort of Don Quixote tilting at windmills. After all, wasn't the country safe in the hands of Eisenhower and wasn't Charlie Wilson the greatest production expert in history?

Today there are many thinking people who are beginning to question the Pentagon civilian leadership as it pertains to air power.

In his current hearings in the Senate, Symington and his colleagues and staff are spinning a web of entrapment for the top civilian command from which there is no apparent escape. To mix a few metaphors, the Don Quixote has become a David challenging the Goliath and closing in for the kill.

Earlier fears that the Symington hearings would just be another razzle-dazzle headline-hunting political show in a national election year have been dissipated. The Senator planned well and thoroughly. There has been no carnival atmosphere. Much has been behind closed doors.

He's been building up his case slowly and steadily with all of the skill of a prosecuting attorney seeking big game. It all points toward a serious indictment of the Defense Department for failing to move rapidly enough toward research and development and air power leadership.

It is not enough, any more, to say that the Symington hearings are only for the purpose of making political hay. True, they are led and sparked by Democrats. True enough they are designed to create a political issue. But the real test is whether there are facts behind the attack. And the facts are coming out steadily.

Quite apart from the hearings, however, Symington and Senator Jackson have not only pushed the Pentagon onto a defensive position but have forced a considerable amount of action. If results count, then Symington and Jackson are actually setting the policy pace for U.S. air power, while the Pentagon relies on watered down public relations.

Here are four specific examples:

1. Senator Symington began his real attack a year ago when the Russians displayed their newest fighters and heavy bombers in the May Day show over Moscow. For almost two weeks the Pentagon remained silent, then issued a cryptic statement merely noting that the Russians "have recently elected to expose some new aircraft developments in air parade formations over Moscow." It was quite a negative approach.

2. Senator Jackson joined Symington in persistent sniping at the Pentagon's lagging drive to develop long-range ballistic missiles. Finally in November the Martin Titan was added as a companion project to the Convair Atlas, and other projects including an intermediate range weapon were given priority and go-ahead.

3. Late in 1955 Symington and others continued to clamor at the insufficient push behind the entire missile program. The plea for a "czar" began. It wasn't until February that Secretary Wilson announced he would try to find a "czar." In due course he appointed Eger Murphree as a special assistant. While presumed to be a good executive, Murphree is no specialist on missiles and has no clearcut authority.

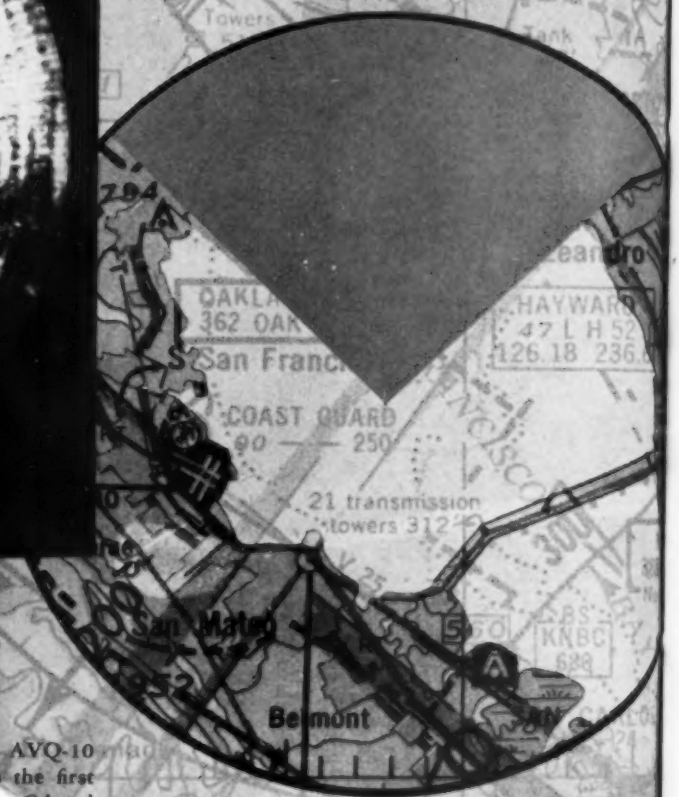
4. Then Senator Russell invited USAF to ask for another $1.5 billion. It took awhile for the Administration to send along a request for more funds to increase the B-52 production rate and for beefing up continental defense and other activities, but the total additional sum asked was considerably short of the invitational figure.

Secretary of Defense Wilson may be sound as a production man, but his attitude toward research and development over the past three years has indicated an incomplete knowledge of what it takes to keep ahead in airpower.

Senator Symington is spinning a tight web. Probably the most amazing thing of all is that the Pentagon has seen the web being spun from the start. It didn't have the sense to move when it had the chance. We suspect it's too late to escape. The Senator is spinning his web too well.

WHEN A PILOT NEEDS A LANDMARK...

Circled portion of aeronautical chart as seen on scope of AVQ-10 on in-bound airliner (Note Hayward-San Mateo County bridge).



Portion of sectional aeronautical chart looking north on San Francisco Bay area.

the exceptional ground-mapping properties of RCA's Weather Radar will spot his position

Air carriers find RCA's new Weather Radar (AVQ-10) invaluable in making landfalls and recognizing landmarks under adverse weather conditions in areas where navigation aids are comparatively inadequate.

The AVQ-10 provides a crosscheck on normal navigation methods, enabling the pilot and navigator to determine their position with great exactness relative to the coast line. This is equally true on inland routes where topographical features show up clearly on the scope. The AVQ-10 also helps to locate the proper entry point in defense areas, where aircraft are limited to "corridors."

These ground-mapping characteristics are in addition to the recognized superiority of the AVQ-10 as a weather radar. It is the first airborne radar to use the C-band (5.6 cm) transmission, the wavelength best suited to weather detection and avoidance, yet having the least amount of scope clutter. With it, the pilot can evaluate storms up to 150 miles ahead and pick non-turbulent paths between them. In addition to avoiding costly detours, the AVQ-10 contributes materially to passenger comfort.

All this has made the demand for the AVQ-10 great and pressing. Many leading airlines have already specified it. To secure early installation, other airline and executive plane operators are invited to write now for further information.

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Washington Report

Those Big Russian Jet Engines

Why haven't Pentagon experts and engine manufacturers shown concern over the big jet engines powering the Russian TU-104 transport? Principal reason is that the engines showed up two years ago in the Badger bomber at the Moscow air show and that it now is concluded they are by-pass jets.

Latter fact weakens significance of the Russian development insofar as the U.S. is concerned, since military men who master-mind engine development in this country aren't interested and won't finance a by-pass program. Airlines, however, favor the engine type because of lower noise levels and better economy. A U.S. by-pass or turbofan engine apparently will have to come from private sources, most likely General Electric, which has shown most enthusiasm.

What about thrust rating of the Mikulin M.109 engine? Closest parallel to the Tu-104 gross weight is the British Comet 4, or about 150,000 lbs. Figuring the Comet's Avon engines provide a power loading of 3.6 pounds per pound of static engine thrust, the Tu-104 engines would come out at 21,000 lbs. each.

However, comparing the Russian plane with the DC-8, which has a power loading of 5.1 lbs. per pound of thrust, the Red engines would be in the 14,700-lbs.-thrust class. Since this is only about 1,700 lbs. above rating of Britain's Conway by-pass engine, the significance of the Russian development lessens, probably explains U.S. indifference.

AF Gets Tough on Reliability

Look for tough new Air Force stand on the matter of equipment reliability. Rumblings from Air Materiel Command indicate this problem has become far more acute in recent months.

Heart of the problem is staggering complexity of new weapon systems, with the growing array of mechanical and electronic components. This is the price the military has had to pay to achieve major advances in the art of combat, particularly in the efficiency of defensive weapons.

Airmen say they can't tolerate unreliable equipment for two basic reasons: In high-speed modern warfare with ever-present possibility of nuclear attack, a malfunctioning weapon is no weapon at all, for rarely will there be a second chance; furthermore, cost of maintaining unreliable weapons with semi-skilled personnel is fast becoming more than the AF can bear.

A possible answer: Maj. Gen. David Baker, Director of Procurement and Production, AMC, proposes all manufacturers "organize toward reliability," giving this objective at least as much consideration as the functions of design and production.

Lowen Challenged

Look for a less than unanimous vote when Senate Commerce Committee votes on confirmation of Charles J. Lowen as Civil Aeronautics Administrator. Reason: Two southern Democratic committee members have challenged CAA's authority to disallow federal aid for airport buildings where racial segregation is practiced.

This surprising development occurred when the committee finally got around to hearings on nominations of Lowen and G. Joseph Minetti as a CAB member. Minetti breezed through at the hearings, reportedly as the result of a deal assuring reappointment of Joseph P. Adams, Democratic Member, next December.

Challenge to Lowen came as the result of a recent field directive on the racial issue.

Army's Fight for Airpower

Watch for Army to open its campaign soon for revision of the Memorandum of Understanding it reached with USAF on use of aircraft by ground units. Arena for the contest: Joint Chiefs of Staff.

Army is drawing up a requirement for a fixed-wing cargo aircraft of three to five tons payload capacity. But before it can start work on the machine, the 1952 agreement limiting it to aircraft with empty weight not exceeding 5,000 lbs. will have to be overhauled.

Ground forces say they have no intention to compete with AF. Says Army's Gen. Howze: "Army's attitude in this aviation business is absolutely honest, and I think our difficulties with Air Force are based largely on a misunderstanding."

But he will have a tough time persuading AF to accept that view, since Air Force has made no secret of its alarm over growth of Army's aviation arm.

Room for 2 Big Copters

Army's planned comparative evaluation of the Vertol H-21 and Sikorsky H-34 helicopters could mean a shift in some orders from one machine to the other, but regardless of the outcome the service will continue to buy both.

It is conceded that existence of two one-and-a-half-ton payload machines in the Army inventory will complicate logistics and maintenance, but the official view is that the problem "already is with us." One solution: employ the two big copters in different theaters.

Comments Maj. Gen. H. H. Howze, Army aviation director: "In the larger view, there are too few helicopter companies to meet mobilization requirements. It's a very small industry in relation to the complexity of its product."

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Letters

Compliments on Editorial Still Flowing

'A Hot Idea'

The following is a letter from the third major U.S. automobile company concerning the April 9 editorial:

To the Editor:

Thank you for your note of April 9th and the intriguing suggestion you make regarding Ford products in Moscow.

I find, on giving the suggestion some consideration, that I can only agree with you that it is a very hot idea, indeed.

I am turning it over to our people in the car divisions for their most serious consideration.

E. R. BREECH
Chairman
Ford Motor Co.
Dearborn, Mich.

To the Editor:

I read your article "It's the Season for Going Off Rockers" in the April 9th issue.

I cannot tell you how pleased I am to read that there is someone in these United States with whom I can agree concerning the terrible "Russian Menace."

I could go into great lengths on the matter which you have already put so well.

I was a Pilot flying B-24s during the war. During a raid in February, 1945, we were forced to bail out in newly acquired Russian territory in Hungary. We spent a month and a half with the Russians before we were returned by C-47s to Italy.

One did not have to be a student of geopolitics to recognize on first hand the tremendous gulf between the Russian and American way of life.

Quite naturally, I have been on the losing end of any arguments about the Russians but it is still beyond my conception that any country could pose such a threat, as we are led to believe exists, in a short span of ten years. It is true that a "multitude of men with clubs" can be considered dangerous but there can be no question about the end result in a dog fight.

Again, I wish to thank you for your splendid editorial and only wish there were more people like yourself who will help dispel the myth of the Russian bugaboo.

JOHN S. HOWELL
President
B & H Instrument Co., Inc.
Fort Worth 7, Texas

To the Editor:

Let me add my applause to that which you have already received on your April 9 editorial. I am circulating it throughout the Franklin Institute.

CAPT. RALPH S. BARNABY, U. S. N. (RET.)
Philadelphia, Penna.

To the Editor:

I rarely write re editorials, but yours in April 9, about "going off rockers" about Russia compels me to.

It is a remarkable editorial, first, in its simplicity and common sense, but most particularly in that it makes a definite and constructive suggestion (which you must admit is rare in editorials), and one which is easy, inexpensive and most effective if carried out.

LOUIS VAN PHELAN
Los Angeles 49, Calif.

To the Editor:

That was a wonderful editorial on the U.S.A. and Russia in the April 9 issue. Keep up the good work. I thoroughly enjoy every issue of AMERICAN AVIATION.

GORDON R. PARKINSON
Trans World Airlines
Kansas City, Mo.

To the Editor:

Due to a belated return from Florida, I am regrettably late in adding my heartfelt applause for your much needed editorial in the April 9 issue. It really needed saying.

BECKWITH HAVENS
New York City.

To the Editor:

The April 9 editorial is very well written and to the point . . . an excellent piece of thoughtful writing.

WILLIAM P. BROTHERTON
Ryan Aeronautical Company
San Diego, California.

To the Editor:

It was certainly a pleasure to read your "Personal View" column in the April 9 edition of AMERICAN AVIATION.

J. CHESLEY STEWART
Trans World Airlines, Inc.
District Sales Manager
St. Louis 3, Mo.

To the Editor:

That was an excellent editorial (". . . Going Off Rockers"). We need more of that kind of thinking.

ART RILEY
Boston Globe
Boston, Mass.

To the Editor:

"It's the Season for Going Off Rockers."

Your editorial in the April 9 issue contains more "horse sense" than anything that it has been my pleasure to read in many a moon.

JAMES R. GRAHAM
Resident Vice President,
Manager Western Department
United States Aviation Underwriters
Chicago 4, Ill.

To the Editor:

Not only do I agree with the criticisms expressed, but also the constructive suggestion embodied in the dramatic delivery of some up-to-date American cars (Cadillacs, Lincolns, Chryslers, or what have you) to the embassy in Moscow. It's so obvious that it is completely mystifying that it hasn't been accomplished prior to this date.

I think it would be extremely valuable if a reprint of this editorial were

to be sent to each member of the Congress of the United States.

W. H. BURGUM
George A. Bass
Construction Company
Birmingham, Mich.

Praise for Miss Philmus

To the Editor:

I have read and re-read the article in the April 23 issue of AMERICAN AVIATION by Lois C. Philmus on the subject of "Aviation's No. 1 Headache." This is without a doubt the finest article on this subject I have ever seen. There is hardly a sentence in it which does not contain a very compact, concise statement.

It is almost impossible to pick out any one section and emphasize it over any others, but I do believe the statements "that brings up a serious situation of the lack of systems planning," "the evolution of the Common System will never take place if a central development authority is not established," and "development and operation by committee must be halted so true progress can be made to meet the industry needs" were in my thinking the highlights of this article.

Quotations from the Harding Committee Report were well chosen and very much to the point particularly the quotation which emphasized the lack of systems planning.

The article pulled no punches and, which is very unusual for an article of this type, did so without rancor or calling of names. It is actually frightening in its message, because it is so true. The last sentence of the article emphasizes this when the author says "Mr. Curtis has been chosen to accomplish the impossible, it has been a long time coming."

F. C. McMULLEN,
Supervisor, Government
Communications Sales
Western Electric Co.
New York City.

To the Editor:

Your article on "Aviation's No. 1 Headache" (by Lois C. Philmus) was excellent. In fact, this whole issue is fine!

JEROME LEDERER,
Managing Director
Flight Safety Foundation, Inc.
New York City.

Liked Transport Issue

To the Editor:

I can't resist sending you a note to tell you that I think that AMERICAN AVIATION's annual "Air Transport Progress" issue was superb. And it is no derogation of the other material in it to say that I was particularly impressed by two items.

One was your own lucid comment on some of the problems, "nothing short of staggering," which lie ahead. The other was Bill Henzey's percipient roundup piece. Both as to literacy and as to content, his article was far superior to the average effort to explore civil airpower policy.

WILLIS PLAYER
Vice President-Public Relations
Air Transport Association of America
Washington, D. C.

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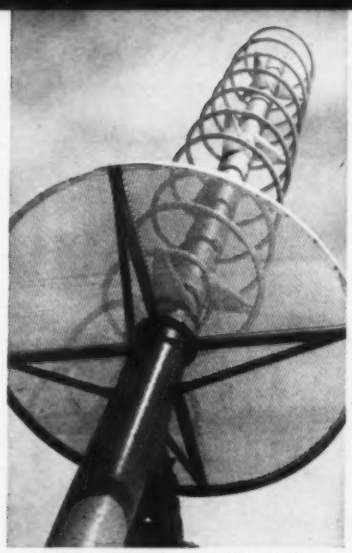
Lockheed Scientists– a new type of bird-man

Pioneer bird-men risked their lives to prove that man could fly. Today's bird-men are the scientists who dedicate their lives to research in the field of missiles (fantastic new "birds" which challenge the imagination) and to the development of the complex missile systems, so important to our defense efforts. Their work is secret, exciting and second to none in military importance—because America's supremacy in aerial weapons faces a menacing challenge.

Lockheed is helping the U.S. armed forces meet that challenge by the rapid expansion of its Missile Systems Division. At Van Nuys, California, a staff of over 3,000 workers is already deeply engaged in top-secret projects for the Air Force. Two new missile research laboratory buildings are being constructed by Lockheed on a 22-acre site in Stanford University's industrial park area at Palo Alto, California. And nearby, on a 275-acre site at Sunnyvale, Lockheed is building extensive engineering and manufacturing facilities.

Everyone at Lockheed's Missile Systems Division is working with a sense of deep urgency to help the nation retain its superiority in missile systems technology—and thus deter attack from any potential aggressor.



A VITAL PHASE of successful missile systems research and development is the testing of vehicles and components under actual operating conditions. This helical antenna (above) receives telemetered data transmitted from test missiles.

(ABOVE) SCIENTISTS at Missile Systems Division using cold-flow test chamber to obtain data on flow rate of liquid fuels at the extreme temperatures which might be encountered by a supersonic, high-altitude missile in flight.

(AT LEFT) DR. LOUIS N. RIDENOUR, first Chief Scientist of the U.S. Air Force (1950-51), now Research Director of Lockheed Missile Systems Division, shown with a senior scientist and a student-scientist* discussing simulated trajectory of a high-altitude ballistic missile. Lockheed's advanced research programs include: conditions bearing on flight into space, chemical propulsion systems, power applications of nuclear energy, physical studies of environments created by radioactivity, advanced studies of applications of electronic phenomena, new principles in the remote guidance field, and others.

(BELOW) A DEMONSTRATION MODEL, used to illustrate the fundamentals of telemetering systems. Many advanced contributions in this field, as well as in the fields of guidance control and data reduction, have been made by Lockheed's Missile Systems Division.

(ABOVE) The speed-up construction program now under way at Palo Alto will permit use of Lockheed's new research laboratories by the start of the fall semester at Stanford University.

**Lockheed's Advanced Study Program helps outstanding students, while employed, achieve MS degrees in Mathematics, Electrical and Mechanical Engineering, Aeronautics and other Physical Sciences. Write: Lockheed Missile Systems Division, Van Nuys, California.*

Lockheed

MISSILE SYSTEMS DIVISION

Van Nuys, Palo Alto, Sunnyvale, Calif.

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When & Where

MAY

May 24-26—Tenth annual convention of Armed Forces Communications and Electronics Association, Statler Hotel, Boston.

May 27-June 3—Annual Convention, Aviation Writers Association, San Francisco.

JUNE

June 2—Seventh annual maintenance and operations meeting, Reading Aviation Service, Inc., Municipal Airport, Reading, Pa.

June 3-8—Summer meeting Society of Automotive Engineers, Hotel Chalfonte, Atlantic City.

June 4-8—National Fire Protection Association, 60th annual meeting, Boston.

June 5-6—Radio Technical Commission for Aeronautics spring meeting with Boston sections of IRE and IAS, Boston.

June 6-8—American Society for Quality Control, Palais Du Commerce, Montreal, Canada.

June 12-14—Radio - Electronics - Television Manufacturers Association convention, Edgewater Beach Hotel, Chicago.

June 13—B. F. Goodrich Technical Forum sponsored by Atlantic Aviation Corp. and Airwork Corp., Teterboro Airport, N. J.

June 17-21—Semiannual meeting American Society of Mechanical Engineers, Hotel Statler, Cleveland.

June 18-21—National summer meeting of Institute of Aeronautical Sciences, IAS Building, Los Angeles.

June 19—Tenth session of International Civil Aviation Organization Assembly, Caracas, Venezuela.

June 20-22—Aviation Distributors and Manufacturers Association 27th annual meeting, Grove Park Inn, Asheville, N. C.

June 30—Jet age conference Sheraton-Jefferson Hotel, St. Louis, Mo.

JULY

July 7-10—Tenth annual All-Woman Transcontinental Air Race, San Mateo County (Calif.) to Flint, Mich.

July 10-Aug. 9—International Aviation Exposition, Mexico City.

AUGUST

Aug. 1-5—Air Force Association annual convention, Roosevelt Hotel and Municipal Auditorium, New Orleans.

Aug. 3-5—Experimental Aircraft Assn. 4th Annual Fly-In, Oshkosh, Wis.

Aug. 15-17—IAS National Turbine-powered Air Transportation Meeting, Grant Hotel, San Diego, Calif.

Aug. 21-24—Western Electronics Show and Convention, sponsored by IRE and West Coast Electronic Mfrs. Assn., Pan-Pacific Auditorium, Los Angeles.

Aug. 22-24—Bendix Scintilla Int'l Ignition Conference, Sidney, N. Y.

SEPTEMBER

Sept. 1-3—1956 National Aircraft Show, Will Rogers Field, Oklahoma City.

Sept. 3-9—Society of British Aircraft Constructors exhibition and flying display, Farnborough, England.

Sept. 12-22—International Air Races, U.S., England, South Africa.

Sept. 25-29—International Association of Aircraft Constructors jet transport conference, The Hague.

OCTOBER

Oct. 1-3—National Association of State Aviation Officials annual meeting, Lake Placid, N. Y.

Oct. 2-6—SAE National Aeronautical Meeting, Aircraft Production Forum and Engineering Display, Hotel Statler, Los Angeles.

Oct. 10-12—SAE National Transportation Meeting, Hotel New Yorker,, New York.

Oct. 23-25—National Business Aircraft Association 9th annual meeting and forum, Miami, Fla.

Oct. 29-30—Third annual East Coast Conference on Aeronautical and Navigational Electronics, sponsored by IRE, Sheraton Belvedere Hotel, Baltimore, Md.

"ENEMY" JET AT ONE O'CLOCK!

The ultimate target for a weapons system is the enemy. Lacking that ultimate target for training, the jet-powered Firebee has been developed by Ryan. It is the first realistic target which can "stand-in" for the enemy to sharpen the sights of the pilots, gunners, missile crews and radarmen who man America's defense system. No other vehicle can be used so effectively to evaluate new weapons systems.

Remotely controlled, the Firebee is a jet-fast "flying bull's-eye" that can operate at the extremely high speeds and high altitudes of modern air combat. Launched from the air or ground, and recovered by parachute, it is economical, not only in original cost, but also throughout its extended operational life, because it can be used over and over again.

Currently in production and being used operationally, Firebees have been delivered to all three military services—Air Force (Q-2A), Navy (KDA-1) and Army (XM21).

The Firebee is dramatic proof of Ryan's skill in blending aerodynamic, jet propulsion and electronics knowledge to solve a complex aviation problem... meet a military need. Ryan's jet-powered VTO now being tested at Edwards Air Force Base is another example of Ryan's forward-looking engineering ability.

Engineers looking for a challenging future will find outstanding opportunities at Ryan.

With a background of 33 years of experience in aviation, Ryan excels in designing and producing high quality aircraft, power plants and avionics, built at low cost, delivered on time.

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SAN DIEGO 12, CALIFORNIA

Industry News Digest

Ford Forms Subsidiary to Produce Aircraft and Missile Systems

Ford Motor Co. has signaled its return as a prime element of the aviation industry with the formation of Aeronutronic Systems, Inc., a subsidiary for for design, development and production of aircraft and missile weapons systems and commercial by-products.

The automotive firm has committed $10 million for construction of an R&D center somewhere in California, to be completed by 1958. By that time the Ford subsidiary expects it will have between 1,000 and 2,000 employes. Production facilities planned for a later date will not be situated in California, in line with Defense dispersal policies, Aeronutronic officials say.

Nucleus of the new company is a group of scientists and engineers from Systems Research Corp. who left Lockheed Aircraft's missile division late last year in a dispute over management policy. They are Dr. Ernst H. Krause, v.p.-R&D, Dr. M. H. Johnson, director-R&D and Dr. J. V. Charyk who will head an aerodynamics and propulsion division.

President of Aeronutronic will be Gerald J. Lynch, current director of Ford's office of defense production and government relations. Directors are Ernest B. Breech, Ford chairman; Henry Ford II; Andrew Kucher, director of Ford Scientific Laboratory; Lynch, Krause and Johnson.

Northrop Gets Contract To Design Jet Trainer

A Phase I contract to design a delta-wing supersonic jet trainer has been awarded by USAF to Northrop Aircraft Inc.

Northrop has been developing the plane for two years with its own funds. Contract calls for design and construction of a mockup, but does not include a prototype.

The small tandem-seat trainer will be cheap to build and operate and will have a performance capability matching that of operational fighters expected in the near future, a USAF spokesman said. Two light turbojet powerplants are under consideration for the plane, but no decision has yet been made.

Doman Delivers First YH-31

Doman Helicopters, Inc. has delivered its first YH-31 helicopter to Army. Eight-place YH-31 (commercially LZ-5) is powered by a Lycoming engine, has been under development four years and recently was certificated by Civil Aeronautics Administration for passenger use. Glidden S. Doman, vp-engineering, left, and Donald S. B. Waters, president, are shown as they turned first YH-31 over to Army Capt. Ellis D. Hill.

Lockheed U-2 Flies 10 Miles High—Easily

National Advisory Committee for Aeronautics disclosed the existence of the Lockheed U-2, a specially-designed aircraft for study of gust-meteorological conditions at altitudes ranging up to 50,000 feet.

Dr. Hugh Dryden, NACA chief, said the USAF is making "a few" of the new Lockheed machines available to NACA for high altitude research to be conducted from the Watertown Strip in Nevada. He said the aircraft is powered by a Pratt & Whitney J57 turbojet and can reach 10-mile altitudes "as a matter of routine." The Air Force has declined to release additional details.

It was learned through other sources that the U-2 is of conventional design with extraordinarily large straight wings to provide better lift at high altitudes. The plane is subsonic, with a capability of only about Mach .75, but it reportedly can remain at altitudes of 50,000 feet for more than an hour. This is rare, even for present-day multi-jet fighters and bombers.

• **Lockheed launched** the U-2 project on its own in 1954 to obtain information on operation of electrical and engine systems at great altitude. One of its major purposes was to gather fuel flow and fuel metering data for use in developing the F-104A Starfighter.

It is understood that fewer than half a dozen of the machines have been produced.

DC-9s Are Offered For Delivery in 1961

Airlines are being offered Douglas Aircraft Company's DC-9 medium jet transport for delivery in the spring of 1961. Price is $2,999,000 including $460,000 for the four P&W J52 engines. An alternative version using 7,000-lb. thrust Rolls-Royce Avons is understood to be under study.

Specifications for the DC-9 project include the following: maximum take-off weight, 134,000 lbs.; maximum landing weight, 106,000 lbs.; payload (space limit) 20,200 lbs. with standard seating (66 in four-abreast, plus six in lounge) or 23,840 with coach seating (94 in five abreast and no lounge).

Wing span, 112.76 ft.; wing area, 1,790.6 sq. ft.; fuselage outside diameter, 130 in.; fuselage overall length, 118.75 ft.; Civil Air Regulation take-off run (standard conditions), 5,800 ft.; CAR landing run (standard conditions), 5,523 ft.; range, 1,770 miles; cruising speed, 483 knots.

Hughes Seeks CAB Permission To Build New Jet Transport

Howard Hughes wants to build a "superior" jet transport incorporating "new developments," and TWA would buy up to 25, with deliveries starting in 1961. But he needs Civil Aeronautics Board permission to get into the commercial plane building business.

Hughes' plans were revealed a few days ago when TWA asked CAB to modify the terms of its 1944 order approving acquisition of control of TWA by Hughes Tool Co.

TWA told CAB it wanted the terms modified so they wouldn't restrict the airline's right to buy from Hughes Tool "up to 25 jet-powered aircraft suitable for operation . . . on both its domestic and international routes."

• **The application** said Hughes plans to build the plane in a new factory located in accordance with USAF dispersal policies. This raised speculation that Hughes might use the plant he announced recently he would build in Florida for the "design, development and manufacture of airplanes."

Hughes Tool in February ordered eight J57-powered Boeing 707s for TWA. And reports persist on the west coast that, despite the CAB application, Hughes has ordered 18 long-range J75-powered 707s for the airline, and that announcement will be made soon. Indications are that TWA is also interested in a short-range turbine transport, such as the Convair Skylark 600 jet.

TWA's application said the company had made thorough studies of all jets available in the U.S. and abroad and had concluded that none of these planes "has the range desirable for all-year around operations across the Atlantic so as to permit non-stop services in both directions under the extreme conditions frequently encountered on that route.

"During the past few years important new developments have occurred affecting jet aircraft which make it possible to design aircraft at this time that are superior in performance, safety and economy to the commercial aircraft now being constructed, the designs for which were initially laid down four or five years ago."

• **Hughes Tool,** it added, has told TWA that, if CAB approves, it will build a jet for TWA, taking into account the "most recent design developments, on terms that are at least as favorable in every respect as those that can be secured from any manufacturer for a similar aircraft." Deliveries would start in 1961.

Hughes also indicated it is willing to sell such planes to other airlines at the same price as sold to TWA.

When CAB approved Hughes' acquisition of TWA in 1944 it specified that commercial transactions between the companies must be limited to items not exceeding a cost of $200 each, with an annual total of $10,000. CAB also said at that time that Hughes' acquisition of TWA would not be adverse to the public interest. "Applicant (Hughes) is not now engaged in and has no plans contemplating production of aircraft, aircraft parts or facilities for use in commercial air transportation," it noted.

Navy to Get First Beech Drone Next Month

The Navy next month will receive from Beech Aircraft Corp. the first of a test quantity of new XKDB-1 drone target planes.

Beech's drone design won over eight others. Flight evaluations will start in July at the Naval Air Missile Test Center.

The all-metal pilotless aircraft can fly at 320 mph at altitudes of more than 30,000 ft. Powered by a 120-hp two-cycle McCulloch six-cylinder opposed supercharged engine, it is 13.5 ft. long, has 12-ft. wing span and gross weight of less than 600 lbs.

The drone is equipped with an electronic guidance system providing positive "out-of-sight" control at ranges of more than 100 miles.

Air Force to Sell 500 Surplus Planes

About 500 surplus planes, including single and twin-engine trainers, cargo aircraft and four-engine transports, will be sold by USAF during late spring and summer. Original cost of the planes was more than $52 million.

USAF during the next few months will sell 22 transport aircraft at Davis-Monthan AFB, Ariz., including four Boeing YC-97s, 11 Douglas C-74s and seven Chase YC-122 assault transports. Four sales of 50 cargo and trainer aircraft each will be held at Hill AFB, Utah. These include Beech C-45s, T-11s and T-7s.

Also planned by USAF is its first auction sale of surplus aircraft, at Kelly AFB, San Antonio, Tex., on June 5. It will involve 87 T-6 trainers. If the auction method is successful, two more sales of 181 T-6s will be held later at Kelly. USAF said all inquiries regarding the sales should be directed to the property disposal officer at the bases.

United Aircraft Elects H. M. Horner Chairman

• H. M. Horner has been elected chairman of United Aircraft Corp., succeeding the late Frederick B. Rentschler, who had held the position from the corporation's organization until his death last month. Horner has been president since 1943 and a director since 1942. He retains his previous designation of chief executive officer.

Horner

Other important promotions included:

• Leonard S. Hobbs, vice president-engineering, elected vice chairman. He will continue to direct the corporation's engineering and research programs.

• William P. Gwinn, general manager of Pratt & Whitney Aircraft since 1943 and a vice president since 1946, was elected president and chief administrative officer. He was also elected to the board and made a member of the board's executive committee.

• Wright A. Parkins, engineering manager of P&W since 1944, was elected general manager of P&W, a vice president of the corporation, and named a

(Continued on Page 21)

Douglas Skyray Becomes Operational

Bat-winged Douglas F4D jet interceptor is now operational, with six planes delivered to Atlantic and Pacific fleet units. Navy also has accepted first factory-to-fleet deliveries of the Douglas A3D twin-jet Skywarrior bomber. F4D-1 is powered by a Pratt & Whitney J57.

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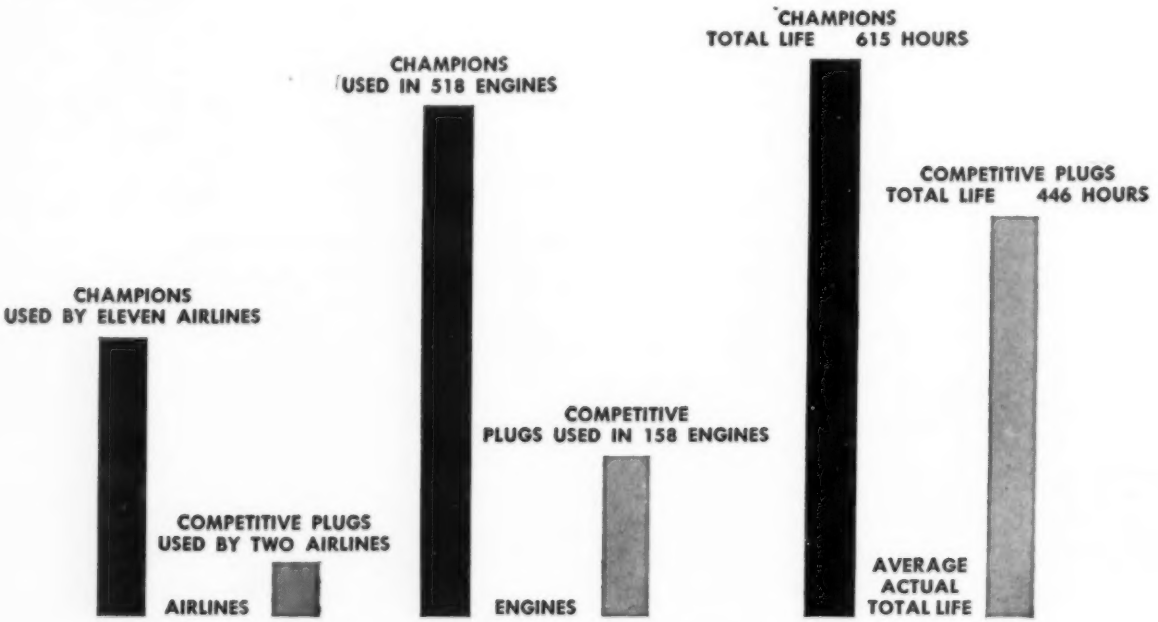
DELTA C&S	DC-7	10	Champion	40	....
EASTERN	DC-7	9	Other	....	36
	L1049C	16	Other	3*	61
NATIONAL	DC-7	4	Champion	14	2*
NORTHWEST	L1049G	4	Champion	16	....
PAN-AMERICAN (Atlantic Div.)	DC-7	9	Champion	26	10*
TRANS-WORLD	L1049G	20	Champion	80	....
UNITED	DC-7	25	Champion	100	....
KLM	L1049C	12	Other	2*	46
AIR FRANCE	L1049C-G	18	Champion	69	3*
TRANS-CANADA	L1049C	7	Champion	28	....
SEABOARD & WESTERN	L1049D	4	Champion	16	....
LUFTHANSA	L1049C	4	Champion	16	....

*Evaluation Test



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TRANS-TEXAS AIRWAYS • TRANS-WORLD AIRLINES • TURKISH STATE AIRLINES
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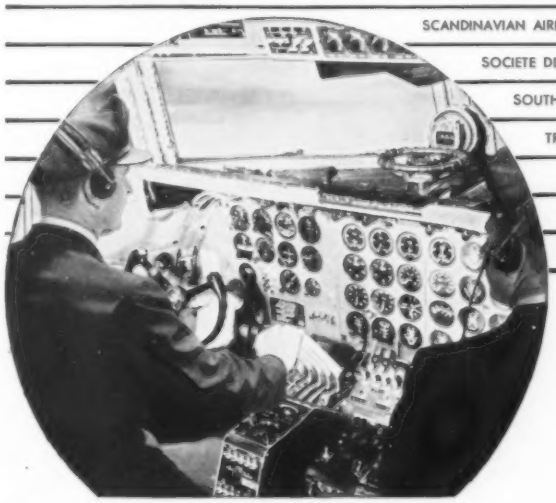

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Great airplane that the Stratocruiser is, she will be far eclipsed by the Boeing 707s, America's first jet transports. These newest Boeings—the 707 Stratoliner and the Intercontinental—are now being built for leading American and European airlines. Deliveries start in 1958 with first service scheduled for early 1959.

These new Boeing jets will bring you new luxury, distance-devouring speed and unimagined smoothness of flight. They represent yet another outstanding Boeing contribution to air travel.

BOEING

Industry News Digest

(Continued from Page 17)

member of the corporation's operating and policy committee.

• Arthur E. Smith, assistant engineering manager since 1952, was named engineering manager of P&W.

North American Changes Name to Trans American

North American Airlines has changed its name to Trans American Airlines to effect compliance with court orders arising out of the name infringement suit brought against the non-scheduled group by North American Aviation, Inc., the aircraft manufacturer.

New name became official May 14. In adopting it, the company chose the name of a non-scheduled airline whose letter of registration has been implemented under the North American banner.

The name change was forced by one of two name suits in which the non-sked combine was involved. Another case, still undecided, centers around a CAB order requiring the group to cease and desist from use of the word "American" in its name.

CAB to Conduct Fare Investigation

Civil Aeronautics Board has instituted a general investigation of the passenger fare levels of the domestic trunk airline industry. Exact scope of the proceeding is to be set following an oral argument before the Board on June 12, at which affected airlines may present their views.

Board's unanimous action came amid heavy pressures from Congress, particularly the House Anti-Trust Subcommittee, for an over-all fare probe.

Reasons given for the new investigation included Board statistics showing airline earnings since 1950 may have been excessive. Agency said the industry's rate of return during that period has ranged from a low of 10.4% in 1954 to a high of 14.6% in 1951.

• **To expedite** what otherwise might be a three-to-five year proceeding, CAB proposed to limit the issues to "those concerning the general level of the passenger fares of the trunkline carriers, excluding all issues as to the lawfulness of particular fares or classes of fares or the inter-relationships between them, and a limitation of the scope of the possible orders to be issued herein to flat percentage changes in the fares of particular carriers or groups of carriers."

Curtis Names 3 Groups To Do Facilities Study

White House aide, Edward P. Curtis, has retained the Airborne Instruments Laboratory of Mineola, N. Y., to undertake a study in cooperation with the Cornell Aeronautical Laboratories and the Aeronautical Research Foundation of Boston as the first step of his long-range aviation facilities assignment.

The three groups will be charged with drafting quantitative traffic and aircraft estimates, both in terms of overall growth and, specifically, as between selected large and medium air traffic hubs.

Supreme Court Upholds TWA Landing Pact

U.S. Supreme Court upheld Trans World Airlines' 20-year landing fee contract at San Francisco International Airport when it turned down the city's appeal challenging the validity of the contract. The Court action thus froze rates fixed in 1942, upholding a U.S. Circuit Court of Appeals decision.

City officials must now abide by the lease and charge TWA at the old rate. The issue was fought in the courts for about four and one-half years, at which time the Public Utilities Commission attempted to levy higher charges.

Difference between old and new rates for TWA was substantial—$73,400, as against $252,090. United Air Lines, largest user of the International Airport, would owe only $89,256 as against $1,091,542. United regards the Supreme Court ruling as applicable to its own case. Its contract runs to 1985 at the old rates.

News Briefs

MANUFACTURING—MILITARY

• **Vertol Aircraft Inc.** re-elected Don R. Berlin as president and board chairman, and nine other directors. Frank Piasecki's bid to expand minority representation on the board was defeated. Piasecki forces elected three of their five-man slate.

• **Dimensions and weights** of Convair's proposed Skylark 600 jet transport are being changed. Fuselage is being extended from 118 to 124 ft. in length to improve cabin space. Empty weight is being increased from 72,600 to 78,100 lbs. Maximum gross takeoff weight is now 173,500 lbs. and landing weight 120,000 lbs.

• **Greer Hydraulics, Inc.** of Jamaica, N. Y. has announced a $1,000 award to be presented in 1958 for the greatest contribution to reduction of noise in jet aircraft. Later this year Greer will give $500 for the best solution to an aircraft maintenance problem.

• **Sperry Gyroscope Co.,** division of Sperry Rand Corp., is supplying the electronic flight control (A-14) and bombing system (MA-6A) for the B-52 bomber.

• **Hiller Helicopters,** Palo Alto, Calif., has completed a USAF Phase I study and detailed design of a retractable folding rotor system for use in a convertiplane. It has received a Phase II contract for construction of the system for USAF tests.

• **Universal Aircraft Industries** bought all equipment, inventory and rights for manufacture of the Aeromatic propeller from Koppers Co. The company, formerly Vest Aircraft, will continue the propeller business at Sky Ranch Airport, Denver.

• **Hayes Aircraft Corp.,** Birmingham, Ala., received a $19,598,616 USAF contract for modification, repair and spares for KB-50 refueling planes. Company has been converting B-50s to three-point tankers, using Flight Refueling's probe-and-drogue system.

• **Goodyear Aircraft Corp.,** Akron, received a multi-million dollar contract to build missile guidance systems (Atran) for the Martin TM-61B Matador.

• **Air Materiel Command** will establish a new top-level position—Chief of Staff—next month. Col. J. T. Kingsley has been named to the post. Deputy vice commander's job, now held by Brig. Gen. F. H. Miller, Jr., is being abandoned. Miller will command the Northern Air Materiel Area in Europe.

TRANSPORT

• **Anthony Milward** was named chief executive of British Airways, succeeding Peter G. Masefield, now managing director of Bristol Aircraft Ltd. Milward joined BEA in 1946 and has served as general services manager, controller of operations, and deputy chief executive.

• **Air Traffic Conference** failed to agree on a no-show penalty system at its Minneapolis meeting May 2-3. A committee is working on further details and the matter will again be considered at a special ATC meeting June 20.

• **Mackey Airlines** and Midet Aviation Corp. asked CAB approval of an agreement under which Mackey would acquire the business and assets of Midet in exchange for 100,000 shares of Mackey's common stock. Mackey holds a temporary certificate for operations between St. Petersburg, Tampa, West Palm Beach, Ft. Lauderdale and Nassau. Midet has a triangular route between West Palm Beach, Miami and West End, Grand Bahama Island.

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Production Spotlight

• Lockheed Test Pilot Tony LeVier has glided the XF-104 more than 50 nautical miles to a safe landing after losing the engine. Glide-angle ratio of the new fighter is said to be better than 10 to 1.

• Australian production of the Lockheed F-104 under license is expected to be requested formally soon. U.S. is likely to approve. F-104 would be built by Commonwealth Aircraft Corp. which currently is about a year away from completing its Avon-powered F-86 production.

• Speed of the new crop of supersonic fighters is so fast that if one gets on a collision course with a slower plane going in the same direction pilot cannot see plane in front of him until he is on top of it.

• This technique is being proposed by some test pilots for low-altitude bailout from high-speed aircraft with downward ejection seats: roll over, eject upward.

• Army has come up with a rocket-propelled foxhole digger (weight 3.5 lbs.) which GI's can fire directly into the ground to produce almost instantaneous cover in event of attack.

• Britain's new transonic windtunnel at Bedford is claimed to be the most modern Mach 0.6-1.3 facility in the world. Project was sponsored by 14 airframe and engine manufacturers, cost $4.2 million.

• Temco has proposed a twin turboprop STOL transport to Army capable of carrying a 3,000-lb. payload, but meeting the 5,000-lb. empty weight ceiling on Army aircraft. Temco financed the design with its own money, claims it can get in and out of a plowed field.

• First flights have been made by France's SNCA du Nord 1405 Gerfault II delta and the first production version of SNCASO's Vautour fighter/bomber.

• Belgium's Hawker Hunter production program is reported in trouble. License-built fighters that have come off line to date are not suitable for operational use, will have to undergo numerous modifications.

• Design of Avro Vulcan has been modified for production versions to give "crescent" form to outer wing. Vortex generators also have been added. Changes are to improve aileron control at high speeds.

• Army is developing a battlefield surveillance system using drones capable of penetrating 200 miles behind enemy lines to keep tabs on troop concentrations, dispersal activity and the like. The drones will have all-weather, infra-red surveillance capability.

• Fairchild's 10,000-pound Trans Air Tractor is presently undergoing tests at Fort Belvoir, Va. The company sold it to the Army for $1 after spending about $500,000 to develop it. Besides bulldozing, the air-transportable machine can pump water, compress air, generate electricity and carry dry and wet cargo.

• Convair is planning something new in pod engine mounting for its Skylark jet transport. Although original artist's sketches showed pylons almost identical to those of Boeing 707 and Douglas DC-8, Convair reportedly will bring Skylark's four G-E J79 engines almost flush against underside of wing.

• Substantial missile contract being negotiated by Studebaker-Packard's Aerophysics Development Corp. (AMERICAN AVIATION, May 7, p. 21) is for Dart Army ordnance weapon. Dart is said to be the last word in missile simplicity and low production cost. Only remaining obstacle to production go-ahead is perfection of a non-electric gyro to guide Dart in its initial phase of launching.

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AIRTRENDS Washington, D. C., May 21, 1956

SENATE DEMOCRATS WILL TRY to boost USAF's fiscal 1957 budget when the defense appropriations bill comes up for vote. Move will be led by Sens. Symington, Jackson, Russell, Chavez and Robertson. Attempt in the House to add $1 billion to USAF funds failed. Senate effort may also fail. Reasons: President Eisenhower's prestige in military matters, testimony of Air Secretary Quarles and USAF Chief of Staff Twining that 1957 budget is austere but adequate.

●

SHORTAGE OF RESEARCH AND DEVELOPMENT MONEY is starting to be felt. USAF has already decided to drop the long-range interceptor competition (Northrop and North American). Supersonic fighter-bomber competition (North American and Republic) may be canceled. Other projects facing the economy axe include Republic's XF-103 interceptor and possibly some missiles.

●

INTERSERVICE WRANGLING over competing weapons systems is hotter than ever. Army accuses USAF of usurping its anti-aircraft mission by selecting the Talos missile for defense of four midwest air bases. USAF claims Navy's striking power in an all-out nuclear war would be "small." Still to be aired is Army-USAF hassle over which should use the medium-range ballistic missile once it's developed. Disagreements can't be attributed entirely to annual "budget jitters." They're deeper than that. Each service is worried about how development of super weapons will affect its roles and missions. Each is fighting to retain present responsibilities and is warding off encroachments.

●

AIRCRAFT MANUFACTURERS' PROFITS in first quarter of 1956 slumped 16.9% below their level a year ago, according to a survey of 28 industry groups. Overall U.S. corporate profits jumped 12.4% in first quarter. Only the aircraft industry and two others showed minus signs.

●

PRIVATE DOUBTS THAT the intercontinental ballistic missile will be ready in anything like the four years usually forecast for it are expressed by Gen. Curtis LeMay, SAC commander. He thinks the U.S.-Russian heavy bomber race deserves top priority.

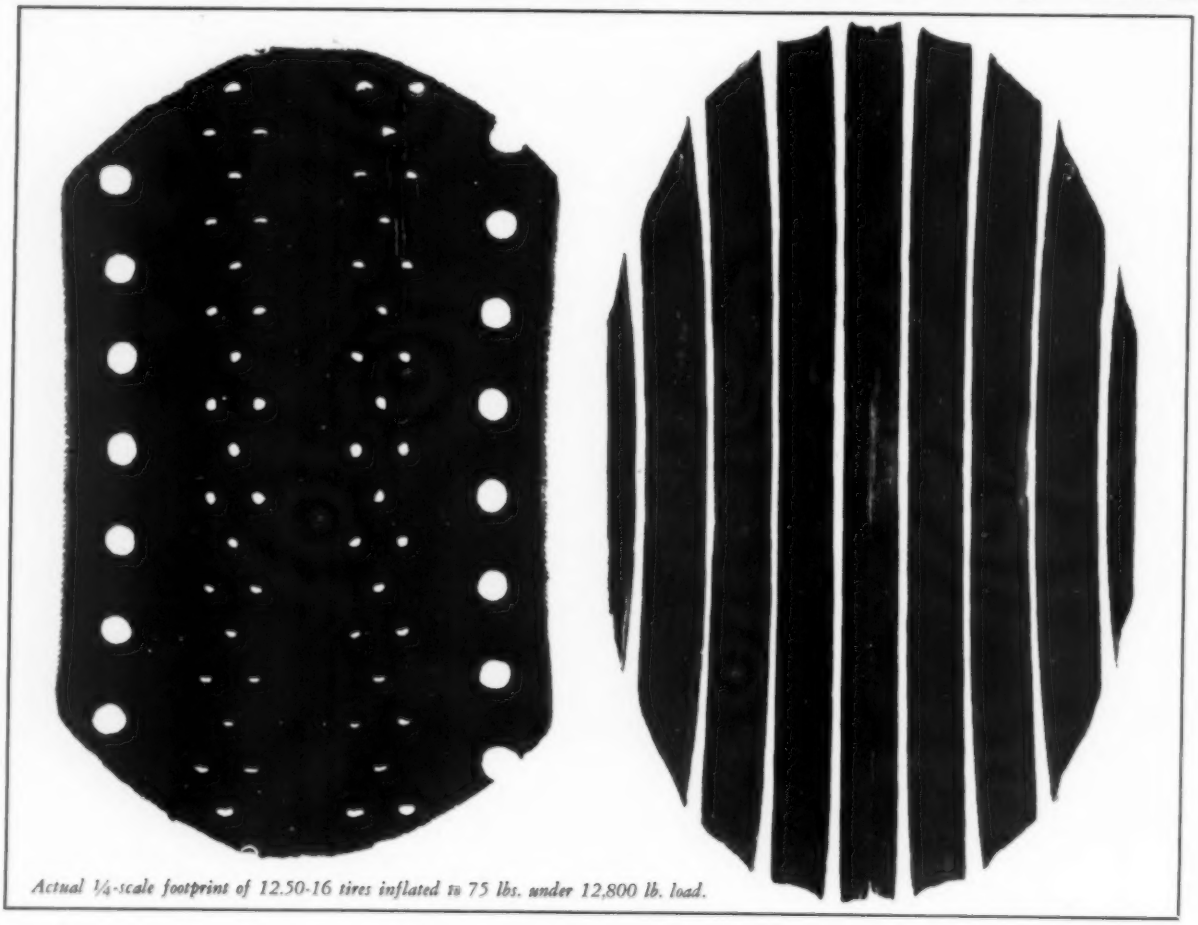
●

HERE'S HOW THE ARMY will boost helicopter strength: present 17 companies will be upped to 48. They'll be organized into 12 battalions, each probably consisting of two light helicopter companies, one medium and one heavy. Army's present fleet of 3,800 fixed and rotary-wing aircraft will grow to 5,200 by 1960.

●

LEAD TIMES FOR AERIAL HARDWARE can be cut if government is willing to spend the money and make quicker decisions on urgency of individual projects. This is Aircraft Industries Association's position. It says that manhours required from design of a supersonic fighter to first flight of prototype are 200% more than for a World War II fighter. Lead time for a modern bomber is nine years; it was two to three years a decade ago. Awaited with interest is report of a special Pentagon group which has been studying ways and means of trimming design-to-first flight lag. Report is due next month.

B.F.Goodrich



Actual ¼-scale footprint of 12.50-16 tires inflated to 75 lbs. under 12,800 lb. load.

One tire gives more landings... which one?

YOU CAN JUDGE a tire by its footprint. The B. F. Goodrich tread pattern on the left gives 10% more landings before recapping, on the average, than the ribbed design on the right!

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Now, notice the most significant difference between the tread patterns—the use of cup-like indentations in the Dimpled Tire. This unique design further reduces wear because the tread rubber around each dimple is compressed under load—making it more stable, more resistant to cuts and tears.

Like the first high-pressure Tubeless Tire and the first 300 mph Tubeless, the Dimpled Tire is another example of B. F. Goodrich leadership in research. Latest example: the first aviation Tubeless Tires in commercial service are Dimpled. *B. F. Goodrich Company Tire & Equipment Division, Aeronautical Sales, Akron, Ohio.*

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How Healthy is the Aircraft Industry?

Overall picture is good, but some manufacturers are beginning to feel pinch of design phaseouts and low backlogs.

By ROBERT M. LOEBELSON

"WE'RE HURTING!" That candid comment was made by a high-ranking official of one of the major companies in the aircraft industry last week.

His statement reflected a condition that was not universal among aircraft and engine companies. On the other hand, it was not quite the exception either.

The present situation is a delicate one for Air Force and Navy officials responsible for aircraft and related procurement to handle. It is a far cry from the Korean War days when every company found itself with more business than it could undertake.

• **During the 1951-1953 period,** when the Aircraft Production Board and the Office of Defense Mobilization were calling for crash plane production programs in case the so-called "police action" developed into a hot war, new plane types were being ordered right off the drawing boards.

But the end of the Korean conflict brought with it new policies which have tended to reduce backlogs. These policies, which can be generally described as "fly before you buy," are known in the USAF as the Cook-Craigie Plan (after the two AF generals who devised it) and in the Navy as the FIRM (Fleet Introduction of Replacement Models) Program.

About the same time, both the Air Force and the Navy enunciated a new procurement concept—the aircraft companies that "build the better mousetraps" will get the procurement dollars and the others will have to shift for themselves.

• **In practice,** of course, it will not quite work out that way. Neither the Navy nor the Air Force will permit any of their historic prime contractors to drop out of the aviation business unless the companies' products prove consistently unsatisfactory.

And the political aspects of such a situation must be taken into account. Congressmen and senators will not stand by while a major plant in the area they represent goes out of operation and thousands of constituents are made jobless as a result.

Despite this, some companies are already in a bad way and others will be in a similar situation during the next 12 months. The rundown of major companies in the industry:

• **Beech**—The T-34 piston trainer will be phased out of production during the third quarter of 1956. However, commercial sales of the Bonanza, Twin Bonanza and the Twin Beechcraft remain high and profitable. This will be aided by the company's victory in a Navy competition for a supersonic tow target.

• **Boeing**—The Seattle and Renton plants are pretty well saturated with production of the B-52 bomber, the KC-135 jet tanker and the 707 commercial jet transport. More orders are anticipated for all three plane types. At Wichita, where the B-47 Stratojet will go out of production next January, a B-52 line is already going.

The Bomarc surface-to-air interceptor missile is slated for output at Wichita. Moreover, both the midwest and Seattle area plants may be called on to produce the WS-110A chemical bomber to succeed the B-52 if Boeing should win that competition with North American Aviation. And the KC-97 will remain in production at Seattle until the end of this year.

• **Cessna**—All five commercial types (the 170, 172, 180, 182 and 310) are selling well and the T-37 jet trainer may prove to be a big money-earner if flight tests go well. Two other projects, the four-engine 620 business airliner and the CH-1 helicopter, tend to enhance the company's sales prospects.

Military Backlogs of Airframe Builders

Eight of 14 U.S. airframe manufacturers experienced shrinking military order backlogs during the past year. The accompanying chart shows how the major airframe companies stand, with indicated backlogs in most cases including letters of intent. All figures are year-end unless otherwise specified.

(In Millions of Dollars)

Company	1955	1954
Beech	$76.3	$75 (est.)
Boeing	$2,273	$2,131
Cessna	$36.5	$33.5
Chance Vought	$214	$188
*Convair	.....	.....
Douglas	$1,280	$1,840
Fairchild	$185	$246
Grumman	$520	$593
Lockheed	$841	$988
Martin	$660	$600
McDonnell	$305 (June 30)	$441 (June 30)
North American	$1,456 (Sept. 30)	$1,372 (Sept. 30)
Northrop	$281	$512
Republic	$519	$950
Temco	$96	$130 (Sept. 30)

* *Not available.*

• **Chance Vought**—Production buildup of the Navy F8U is still under way although the F7U-3 line is coming to an end. Regulus 1 and future missiles (and a new J79-powered fighter proposal) mean that Chance Vought is in pretty good shape.

• **Convair—San Diego** has the F-102A just starting, but commercial transport business is tapering off. Unless orders start coming through for the Skylark 600 jet transport proposal, that particular facility may have to lay off workers now engaged on the 340/440/C-131 project.

Pomona plant is busy turning out Terriers and will start output of Tartar missiles. The new Sorrento plant will employ 6,600 on the Atlas ICBM by 1958. Fort Worth, which is busy on B-36 SAM-SAC, is hopeful that the B-58 Hustler and WS-125A nuclear bomber projects will involve large-scale production after mid-1957.

Douglas Very Busy

• **Douglas**—All three California plants (Santa Monica, El Segundo and Long Beach) are busy with missiles and such planes as the B-66, DC-6/7/8, C-133, F4D, F5D and A4D. Tulsa will end B-47 production in December but a B-66 line is already under way and the giant C-132 is slated for production there. B-66s end early in 1958.

• **Fairchild**—C-119 production is ended and C-123B output is due to be phased out by the first quarter of 1958. The Hagerstown facility is attempting to hold its labor force up by putting the F-27 turboprop transport into production in hopes that enough orders will eventually materialize from local service carriers. Other hopes include a VTOL-STOL plane for the Army, the Goose missile for the AF, a four-jet utility plane for commercial and military use. The company is building a prototype of the M-185 jet utility plane with its own funds.

• **Grumman**—Output of the F9F-8 Cougar is now in a sort of backup stage if newer planes do not prove out as expected. However, the F11F Tiger will become a big production item if tests prove its worth.

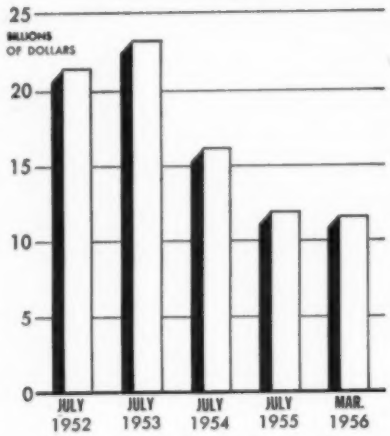
• **Lockheed**—Burbank has considerable commercial Super Constellation and Electra transports on order but the AF C-121 will go out of production about the end of this year. T-33, T2V and F-104 orders are still high but the P2V Neptune series cannot go on much longer. At Marietta, where B-47 production will end in December, the C-130 is already in production and the nuclear-bomber and supersonic jet tanker are under development.

• **Martin** is very thankful for a recently awarded Phase II contract from the Air Force for a supersonic tactical bomber because the B-57 line comes to an end early in 1957. The Matador and P5M-2 lines would not have been enough. The P6M Seamaster is due to become a large-scale-output airplane and the new Denver Division will build the Titan ICBM.

• **McDonnell** is presently almost inundated with work on the F-101A and B, the F3H-2, the upcoming F4H and production for several missiles, including the Bendix Talos.

• **North American Aviation** at Los Angeles has few problems with the F-100 already in production, the F-107 coming up and some F-86 work continuing until the end of the year. The Navaho intercontinental missile may prove to be ordered into production in case the ICBMs take longer than expected. In addition, NAA is one of two companies in two USAF competitions for a long-range interceptor and a high-speed fighter-bomber.

Defense Department Unpaid Obligations



**These figures are for total aircraft and related equipment ordered by the Air Force and the Navy, including guided missiles, drones, etc.*

At Columbus, T-28 and F-86H output has ended but the FJ-3 and FJ-4 and the F-100 remain in production. NAA-Los Angeles is also in on the chemical bomber competition with Boeing.

• **Northrop**—F-89 interceptor production ends during the third quarter of 1956 and the Hawthorne company has no plane scheduled to take the Scorpion's place. Some subcontracts have been obtained and the Snark intercontinental missile is now in "pre-production" status. Even if Northrop should win the AF's long-range interceptor competition, there will be a break in the production line.

• **Republic**—Output of the F-84F has been cut and the program stretched out but there will still be an 18-month lag between the time the Thunderstreak phases out and the F-105 reaches its peak. The F-84F will stay in production at a lower rate until the end of 1957.

Engine Situation

On the engine side, this is the picture:

• **Pratt & Whitney** and **Ford-Chicago**—Both of these facilities are booked into 1958 on the J57 and J75 turbojets for Navy and Air Force use and P&W has large commercial orders for the two engines as well. Moreover, the East Hartford facility is also turning out the T34 turboprop for the C-133 and is developing the J52 turbojet (about 7500 pounds thrust), the T57 (15,000 hp) for the C-132 and an atomic engine for the Lockheed nuclear-bomber.

• **General Electric**—Although the Evendale facility at one time (during the height of the B-47 and F-86 programs) was the largest producer of jets, productions of the J73 for the F-86H, and the J47, for the Stratojet and Sabre has ended. GE, however, now is turning out the J79 for the Lockheed F-104 and Convair B-58 and probably it will end up in several other planes as well.

The GE-financed X-84 turbofan for commercial and military use has been cold-shouldered by the AF, at least temporarily, but the 1,000-hp T58 shaft turbine for helicopters and the 2,000-pound-thrust J85 may prove big dollar-earners. In addition, a development contract for the J77 (reported to be in the 25,000-pound-thrust class) has been held by GE for several years. GE is also developing the atomic engine for the Convair nuclear airframe.

• **Allison**—The J71 is now used only in two production planes, the F3H-2 and the B-66 and will probably continue in relatively low-scale production until the B-66 line ends early in 1958. Some short-life J33s are being turned out for the Regulus and Matador but the J35 is no longer in production. Big production engine at Indianapolis is the T56 for the Lockheed C-130 and Electra. Others under development include the T54 and a 25,000-pound-thrust turbojet for the Navy.

• **Wright**—AF's decision to abandon the J67 (except for the J67-ramjet combination for the Republic F-103) was a blow and so was the recent cutback of 290 F-84Fs. The J65 is in production for the F-84F, B-57, FJ-3 and 4 and F11F-1 but will probably phase out by the end of 1957. Little military or commercial interest has been noted in either the T47 or T49 turboprops, but Wright undoubtedly has new turbojets, turboprops, ramjets and rockets under development. However, Roy T. Hurley, president, recently noted that C-W's 1956 goal is 50% commercial business. The R-3350 Turbo Compound

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HOFFMAN makes the complete airborne portion of the TACAN system—another example of Hoffman integrated electronics at work

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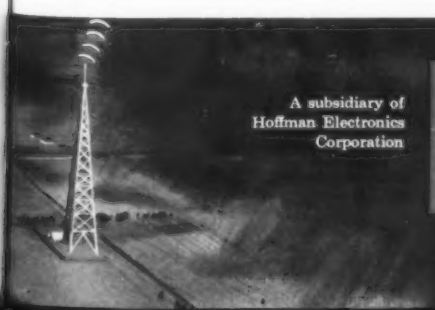

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is a good dollar-earner in this respect but virtually all recent airline orders have been for jets or turboprops rather than for Super Connies or DC-7s.

• **Westinghouse**—Badly hurt by Navy cancellation of the J40 and reductions in the J46 program, the Kansas City facility is pinning its hopes on the company-financed 6,000-pound-thrust J54, now under evaluation by the Navy. If this lightweight engine does not pan out as Westinghouse hopes, it will probably disappear as one of the major engine suppliers.

Helicopter Picture

As far as the major helicopter companies are concerned:

• **Sikorsky** appears to be in the best spot because its S-55 is still being produced commercially even though the H-19 line has ended. The S-58 (military H-34) is now in production for civil and military users. And the S-56 (H-37) has encountered some development bugs but seems to have the best chance in the large helicopter field.

• **Bell** won an Army utility helicopter competition with its T53-powered H-40 but received a blow to its military and commercial hopes when the Navy cut back orders for the HSL anti-sub rotorcraft. The Model 47 is still a good commercial profit item and orders keep trickling in for military variants of the 47 (the H-13 series).

The Buffalo facility is hopeful of getting back in the airframe business as a result of two prototypes (one a VTOL) which are due to fly this year. And Buffalo's missile and rocket engine work keeps growing too.

• **Vertol** received a severe shock when the Army and Air Force decided to abandon the H-16 project. The AF's H-21 will wind up during 1956's third quarter but a brand-new order from the French for 200 H-21s will tide the Morton, Pa., over for the next year or two. Unless one of the services soon buys a Vertol proposal, the company will be in serious trouble in 1958. ◈◈◈

Army to Set Up Traffic Management Agency

Almost all responsibility for military traffic management has been given to the Army, which has been authorized to create a new Military Traffic Management Agency.

Defense Secretary Charles Wilson gave the new agency authority over all forms of commercial and military transportation within the U.S. except ocean-carrier functions of Navy's Military Sea Transportation Service. Purpose is to consolidate authority and responsibility for transportation in the hands of a single manager. "Substantial annual savings" are expected.

Piper Tests Tri-Pacer with Dual Engines Driving Separate Propellers

Piper Aircraft Co. has been conducting a unique experiment with a dual-engine equipped Tri-Pacer. While the Tri-Pacer does not lend itself to the development of a successful installation of this kind, it has been found to be a practical test platform.

Principal involved, according to Howard Piper, vice president, is the installation of two engines, driving separate propellers, in almost entirely independent systems.

The lower engine is equipped with a starter and generator and is mounted in a conventional installation. The upper engine has no starter or generator. It has been installed in an inverted position with the carburetor mounted back near the firewall, a separate oil tank attached and crankshafts placed close together.

Upper engine has an extension on its crankshaft, bolted to the standard propeller flange. On the front of the extension is the propeller for the top engine. On the rear of the extension are two roller bearings on which the rear propeller and its drive pulley rotate.

• **Thus, Piper explained,** if the top engine and its extension are stationary, the lower engine turns the upper pulley and its propeller on the motionless shaft. If the top engine is operating and the bottom engine stopped, the extension shaft rotates inside the stationary rear propeller and its pulley. If both engines and propellers are operating, there is no relative motion on the extension shaft. The shaft is the only part in the dual installation common to both engines.

Advantages cited for the dual installation is prevention of yawing in event of loss of power from one engine and reduction in drag, with only one nacelle rather than two and a nose. Elimination of long controls and lines to wing installation also is cited.

Disadvantage encountered is the interference between the propellers. "The reduction in efficiency which this interference creates, particularly when one propeller is stopped, could probably be lowered to a practical level if feathering propellers are used," Piper said. "There is also apparently a considerable loss in efficiency in the present arrangement due to the tendency for the rear propeller to ride directly behind the front propeller, and no doubt an improvement could be gained here by using contra-rotating propellers."

• **Piper has used** two Continental 90 hp engines in the tests, substituting for the 150-hp Lycoming engine installed on the Tri-Pacer. Fixed pitch propellers have been used, rotating in the same direction and separated by about the chord of a prop blade.

Static thrust with both props turning is 775 lbs., compared to 530 lbs. with the standard engine. Takeoff with light loads can be made with one prop stopped or windmilling and a rate of climb of 100 to 200 ft. per min. can be maintained at low altitudes.

Army, Navy Seek New Observation Plane

Bids on a two-place observation plane with top speed of about 300 knots are expected to be invited by the end of the month by the Army and Navy. The services are conducting a joint competition, with the Navy acting for the Marine Corps.

Prospective bidders will be provided with a list of available powerplants for their design proposals. It will presumably include piston engines as well as turboprops and jets.

Military characteristics to be required of the plane were drawn up by Army and Navy from design studies completed by North American Aviation, Fairchild Engine & Airplane Corp., Cessna Aircraft Co. and Hiller Helicopters. Kaman Aircraft's proposal for a K-16 twin-boom STOL aircraft was not considered.

Administration on Defensive in Airpower Debate

Gen. LeMay adds fuel to Sen. Symington's charges that U.S. is losing superiority to Russian Air Force.

By FRANCIS J. KEENAN

Quietly, almost imperceptibly, the balance in the raging airpower policy debate has shifted.

Now, the burden of proof, at least in part, has moved from Democratic critics of Administration policy to the Administration itself—to demonstrate that U.S. airpower is and will be adequate in the face of the growing quantity and quality of Soviet air forces.

• **The issue,** as it has narrowed down before the Symington Airpower Subcommittee—still the focal point of the debate—is this:

Will effective long-range U.S. striking power continue to be adequate enough to absorb an initial all-out attack and still be strong enough to inflict overwhelming damage on the aggressors to the extent that this retaliatory capacity will be sufficient to deter potential aggression,

As of now, just about everyone concedes the U.S. has such a capacity.

But, looking ahead to the period 1958-1960, Strategic Air Commanding General Curtis LeMay flatly states that present programs are insufficient to retain that superior striking power.

• **Several times** during his two-day testimony before the Symington group, the SAC chief was asked, pointedly, whether U.S. striking forces should be "initially stronger" than the attacker's in the event of a surprise Russian aggression. Just as pointedly, LeMay replied "yes" each time.

Repeatedly, too, he insisted on coupling with this strategic judgment the military facts that the USSR is currently out-producing the U.S. in long-range jet bombers, and at present and programmed rates of production the Soviet lead will be "substantially" greater by 1958-60.

Chain of Developments

LeMay's testimony set off a chain of developments:

• Defense Secretary Wilson conceded that Russia is building more Bisons than the U.S. is building Stratofortresses, but refused to predict the relative power situation in 1960.

• Simultaneously, however, he announced a 50% increase in the size of SAC's B-52 wings, from 30 to 45 planes in each of the 11 wings.

• The next day, LeMay testified that only 78 of the new bombers had been built, and 31 of them rejected by the AF, as of April 30. Later, it was learned that the trouble—correctable in a "relatively short" time, LeMay said—was a defective flywheel in the electrical system.

• The *New York Times* reported it was told the Soviet Union has produced more than 100 Bison jet bombers, the B-52's counterpart. The report was "understood" by the *Times* to have been an intelligence estimate given to the Symington subcommittee.

• The House Appropriations Committee, recommending a $33.6 billion defense budget for fiscal 1957 that included all the aircraft procurement funds asked by the AF and Navy, reported in worried tones that it had acceded to the Administration's "fundamental" policy decision *not* to stay ahead of the USSR in numbers of planes. Rather, the U.S. would seek a "sufficient" Air Force equipped with the best aircraft to serve as deterrent to possible aggression.

• The President confirmed this decision the next day. Obviously aware of increasing concern at reports of Soviet progress, he told his press conference that U.S. airpower would look better once the full story, including SAC's 1,500 medium jet bombers, its chain of foreign bases, and the Navy's powerful air arm, was told by the Pentagon. He did not believe it necessary, he said, that the U.S. out-produce the Soviet Union in any one weapon, including long-range bombers, as long as the country "gets what it needs."

• Then, in rapid succession, (1) Senate dean Walter S. George (D-Ga.) expressed doubt that the American people would accept the President's contention that the U.S. need not match Russian intercontinental bomber production; (2) Secretary Wilson told the Senate Military Appropriations Subcommittee that the AF had ordered a speed-up in B-52 production from a previously programmed 17 per month to a peak of 20 planes monthly—even though the current production level was only six a month; and (3) he revealed that the AF planned to buy 202 B-52s with fiscal '57 funds—an increase, he said, of 12 over original AF estimates, and made possible by the President's supplemental request for $549 million in April.

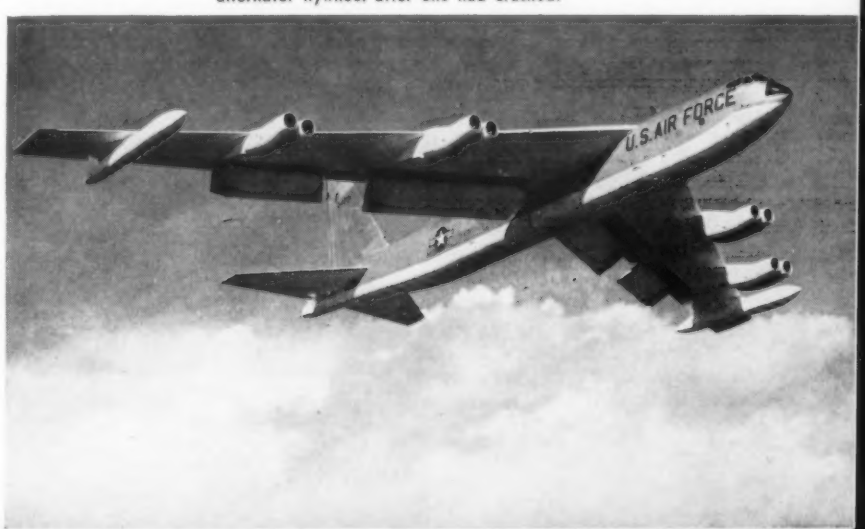
Situation Unchanged

But nothing had really changed. Partisans on both sides were sticking to their claims. And the Administration defense budget was passed unanimously by the House in substantially the amounts requested.

• **Secretary Wilson,** backed up by Administration spokesmen in Congress, defended the budget as "sound" and "adequate." He categorically denied that the USSR was "far outstripping" the U.S. in airpower. And he insisted that U.S. security problems are not identical with those of the Soviet Union, and that we "should not be competing in an all-out armaments race with the USSR or any other country." The "heart" of American long-range striking power, he reminded Senators, is the B-47 which represents "the most power-

Air Force Announces Longer Range B-52C

Newest Boeing Stratofortress is this B-52C, boasting enlarged external fuel tanks for considerably more range. A similar version, known as B-52D, is in production at Boeing's Wichita plant. Stepped up B-52 production has been ordered. Seventy-eight Stratofortresses had been built up to May 1, but 30 were grounded temporarily because of a defective alternator flywheel after one had crashed.



ful single element of air power in the world today."

• Outspoken critics of Administration defense policy, like Sen. Henry M. Jackson (D-Wash.) and Rep. Daniel Flood (D-Pa.), kept up their demands that greater efforts be made to meet Soviet progress. Jackson, estimating it would take "several billions" to provide the additional B-52s, KC-135s, Z.I. bases, and personnel benefits needed by Gen. LeMay, backed this up with a reminder that AF Chief of Staff Twining originally asked a minimum of $20 billion for fiscal 1957.

• But Rep. George Mahon (D-Tex.), chairman of the House Defense Appropriations Subcommittee backed the budget as reported by his subcommittee after months of hearings and 6,500 pages of closed-door testimony. Resisting demands that more money be forced on the Pentagon, he said "they wouldn't spend it." He painted a dismal picture, however—of a U.S. losing "relative military supremacy," of the Soviet possibly firing the first ICBM, of no "adequate answers to our military and international problems."

As far as he was concerned, Mahon told the House as debate on the $33.6 billion bill opened, the budget recommendations reported by his committee represented everything the services will admit and can demonstrate they need.

• **Highlights of** the House-approved budget included:

• New AF money totalling $15,479,125,000—though obligations and actual spending would run a good bit higher due to carryovers from previous budgets.

• More than $5.5 billion for research & development in the three services.

• For the Navy air arm, more than $1,732,900,000 in procurement funds—nearly double fiscal 1956 appropriations.

• An AF guided missile program amounting to $1.3 billion, up from $760 million currently, and reflecting, the committee noted, "the acceleration of the ICBM program and the IRBM program" as well as continued emphasis on defensive missiles.

Committee Members in Doubt

Apparently a little frustrated that no major changes could be made, the Committee reported "considerable doubt" among some members that improved aircraft and the newest weapons were being introduced into service as rapidly as technological advantages permitted. They urged that the situation be "explored" and that the transitions be expedited.

• **Meanwhile,** the Symington subcommittee plodded on—principally in executive sessions with top-ranking AF generals and in staff interrogations of working-level experts.

And the fundamental question—toward which they presumably aimed—remained unanswered. It was the strategic question, involving all aspects of U.S. airpower, that asked: can the U.S. discourage Soviet aggression by guaranteeing it has sufficient striking power to demolish the Soviet Union even after taking an all-out Russian attack?

Despite the talk and the testimony, the issue had not frankly been joined. It remained for the Symington study, first, to get both sides together, talking about the same things in like words.

Light Turboprop Engine Steals Copter Show; Holds Much Promise

By HENRY T. SIMMONS

General Electric's new turboshaft engine, the 1,000 shp T58, was a star attraction at the Twelfth Annual Forum of the American Helicopter Society, held in Washington this month.

In making the first public display of the powerplant, GE confidently predicted that almost all helicopters produced in the U.S. within the next 10 years will be powered by gas turbine engines. What's more, it backed this forecast with the announcement that it plans to invest an additional $20 million over the next five years on small aircraft engine research and development.

"GE feels that, conservatively, there will be at least 600 commercial passenger-carrying helicopters in operation by 1966," said Guy C. Shafer, general manager of the company's Small Aircraft Engine Department in West Lynn, Mass. "Currently there are fewer than 25 such aircraft operating in this country," he observed.

The axial-flow powerplant, like the Avco Lycoming T53 of 825 shp, employs a free power turbine which is not linked mechanically to the gas generator turbine which drives the compressor. The power turbine is driven by the same gases which turn the gas generator turbine. The T58 also employs an automatic fuel metering system to maintain constant rotor speed at various power settings.

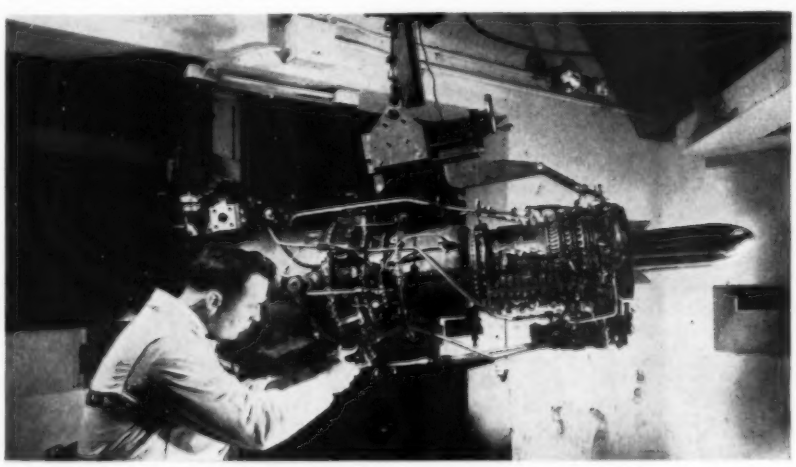
The T58 has a military power rating of 1024 shp with reduction gear and 1050 shp without the gear. Its specific fuel consumption is 0.69 pounds per horsepower per hour. Other specifications:

Weight	250 pounds
Reduction gear	75 pounds
Specific weight (basic engine)	0.24 lb/hp
Over-all length	59 inches
Diameter (maximum flange)	16 inches

• **Security restrictions** prevented GE engineers from discussing the engine's operating temperature and unique features of its six-stage compressor. But it was clear to all who cared to look that the engine's compressor utilizes variable pitch stator blades like the system in the J79 in order to maintain a stable flow of air through the engine.

An actuator mounted on the left side of the engine housing controls the stator pitch of four compressor stages through a set of pushrods. The control is integrated with the engine's automatic fuel metering system.

The Sikorsky S-58 helicopter has been selected as the flight test vehicle for the T58. Two of the GE powerplants will be installed in the machine



GE's 1,000shp T58: star of helicopter forum.

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to replace the 1,525-hp Curtiss-Wright R-1820 normally used.

Another new development during the AHS meeting was the unveiling of SB-12 twin-engine, single-rotor "utility flying crane" helicopter by Omega Aircraft Corp., New Bedford, Mass. Omega described it as one of the lightest ever built in relation to its power, noting that it weighs 2,850 pounds and can carry a 1,020-pound payload plus pilot and two hours of gasoline. Power comes from two Franklin engines rated at 200 hp.

"It is my belief that a helicopter is just another machine, and not a glamorized and refined flying thoroughbred," said Bernard Szyncer, Omega president and designer of the SB-12. He laid particular stress on the fact that his helicopter employs fewer than 600 moving parts.

• **Featured speakers** at the Society's two-day meeting May 3 and 4 were Rear Adm. Lawrence B. Richardson, USN (Ret.), senior vice president-engineering, General Dynamics Corp., and Maj. Gen. Hamilton H. Howze, Army Aviation Director.

Howze said the helicopter has wrought a revolutionary change in Army tactical doctrines, from both an offensive and a defensive standpoint, but he also had some pretty harsh things to say about the cost and complexity of the rotary-wing aircraft.

As it now stands, he said, the helicopter is "unacceptably" expensive to the Army; it is "unacceptably complex;" and the life of its components is "unacceptably short." He conceded that progress has been made on these problems, but said the helicopter maintenance problem "remains simply flabbergasting." He urged the manufacturers, as their paramount goal, to eliminate complexity and achieve a longer life for rotors, transmissions and gear boxes.

"I hope you understand that a low availability rate for helicopters does not by any means react towards increasing the requirement for the number of them," he declared. "Its effect is quite the opposite: low availability and high initial and continuing expense make the article too rich in terms of cost per ton-mile for the military to stand, and decreases the quantities of our purchase."

• **A total of 19 papers** and other presentations were given during the sessions of the meeting. They ran the gamut of helicopter design, development, testing and operation. Among the subjects discussed were Lycoming's T53 gas turbine, GE's T58, the development of the XV-3 Bell convertiplane, rotor mechanics, helicopter flight testing, use of helicopters as tugs, training of military helicopter pilots, navigational problems and the like.

Gen. Gavin Predicts Copters Will Transport Missiles

Helicopters will eventually take over the task of transporting Army missiles from "centralized stockpiles" to the battle units that will use them.

This new task for rotary-wing aircraft was forecast by Lt. Gen. James Gavin, chief of Army Research and Development. He indicated that surface-to-air missiles would be transported in this manner and implied that even larger projectiles of the ballistic type might be moved this way.

Gavin said the Army has a "tremendous need" for vertical lift vehicles and improved powerplants and urged helicopter manufacturers: "Get on with the business and give us better vertical lift."

"Give us tactical lift and we will give you tactical victories," he declared.

James S. Ricklefs, president, Rick Helicopters, Inc., San Francisco, presented a forthright appeal for increased federal subsidy to promote the growth of the helicopter transportation industry. He criticized CAB's present policy of relegating commercial helicopter transportation to an "experimental category" until such time as American manufacturers develop 35- to 50-place machines capable of operating without subsidies.

"It should be noted that not once was the early airline industry placed in an 'experimental stage' in order to improve its cost structure or competitive position," he said. "Rather it grew rapidly, regardless of high operating costs, at the expense of the government . . . it is easy to conclude that during most of the past 30 years, mail pay subsidies have been the lifeblood of the air transport industry."

Noting that local service carriers are getting the bulk of the government's present air subsidy payments, Ricklefs asked: "Why should one type of air carrier be exempt from the importance of maintaining a low cost structure and receive a tremendous subsidy payment, while a similar type of carrier is penalized for incurring relatively high operating costs and operated on an 'experimental basis' still receiving a relatively small subsidy?"

$6.5-Million Cut in CAA Budget Stymies Lowen's Navaid Plans

By LOIS C. PHILMUS

The House of Representatives ran true to form in slashing CAA's $202,618,000 budget request for fiscal 1957 by some $6.5 million. The cut that hurt most was in the vital $40 million request for establishment of navaids.

Although House Appropriations subcommittee members severely criticized the Department of Commerce for not approving the original estimate of $55 million for launching the $246 million five-year plan (AMERICAN AVIATION, May 7), it blithely proceeded to reduce the minimum $40 million requested to $37.5 million.

CAA Administrator Charles J. Lowen earlier this month appealed to the Senate Appropriations subcommittee to restore the House cuts. He told the Senate that if the $2.5 million were not restored for new navigation facilities, the entire secondary radar program planned for fiscal 1957 would have to be deferred.

Lowen revealed that CAA had planned to install 18 of the beacon systems at five air traffic control centers and 13 control towers at a cost of $2,012,050, with an additional expenditure of $140,950 for 29 airborne radar beacons to be used for the evaluation program.

• **Now Lowen** has been forced to consider eliminating the beacon program. Earlier he had told a group in Tulsa that he considered this item "so urgent that it is CAA's intention to skip some of the usual development steps, and install five ground stations for actual tests even while laboratory improvements go on." But he was later forced to tell the Senate that the program, while of major importance, could not take precedence over the long-range radar, peripheral communications and other items scheduled for the critical first year.

The Air Transport Association jumped to CAA's defense. In a memorandum submitted to the Senate subcommittee, it set forth a tabulation which showed what facilities the Air Coordinating Committee had cut out of the year's program to bring the request down to $40 million.

Deleted by ACC were 25 airport surveillance radars; 16 secondary radar; 62 lead-in-light systems; 36 transcribed broadcast units and all of the 25 stand-by air-ground communications originally recommended. This, ATA pointed out, represented an exact money reduction of $14,932,000.

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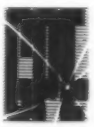

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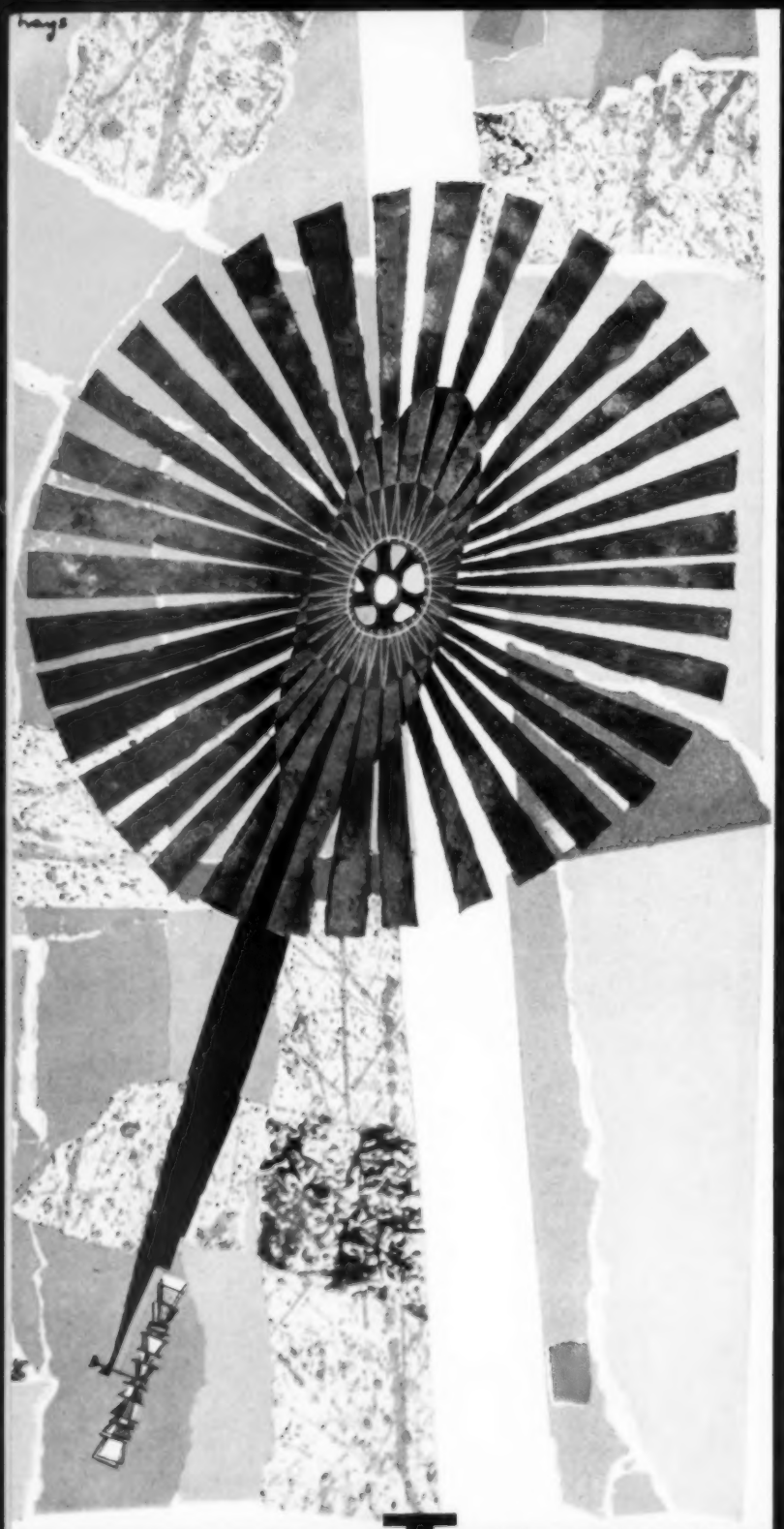

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Louis S. Rothschild observed that the $40 million was the "bare minimum" but added that the $55 million had been "arrived at in a hurry." "Closer examination" by ACC, he added, brought out that things thought possible in the first year were not obtainable for fiscal 1957.

Short-Range Problem

• But while Congress evidently was left to decide the immediacy of the beacon's future, the Administration was still tangling with that other stickler: the short-range navigation system. The House Appropriations hearings, released almost two months after being held, actually have not presented an up-to-date picture of the infamous TACAN/VOR-DME battle.

While Rothschild's answers to some sticky questions shot out by subcommittee members have been interpreted in some quarters as tolling the death knell for civil DME, events in subsequent weeks refute it. However, during the hearings Rothschild made some significant statements:

• "I don't think it is a good expenditure of public funds to go out and install more DME and operate more DME . . . and spend the public money in that manner until there has been an indication that the industry needs it more than it has indicated up until now."

• "Tacan is not today available and may not be available in the time set in the ACC papper (1960) . . . That appears to me today to be as good a figure as it was a year ago on the other side. But it (Tacan) is now in about the same position . . . that radio was when you used to make sets at home . . . You used to buy the components and put them together at home, drill the holes in a panel—that is about the shape that Tacan is in today."

In the meantime, CAA has asked for funds to operate the 241 DME stations through fiscal 1957 that have been functioning in 1956. Here's what has happened since the testimony was given:

• Air Navigation Development Board did not meet its May 1 deadline for submitting the technical reports on Tacan to the ACC. Major stumbling block has been a "misintrepretation" between the two halves of ANDB, Defense and Commerce. Significantly, the only statement Rothschild made to AMERICAN AVIATION on the reported conflict was there is "no insurmountable problem as long as people are open minded."

• The airlines, which have displayed an open reluctance to commit themselves to a distance-measuring system of any kind, indicated at an Air Transport Association meeting in Colorado Springs that equipment would be needed by 1958.

• The airlines have been playing a waiting game, obviously hoping for a decision. Commerce and CAA, as indicated by Rothschild's statement before appropriations, have been waiting for a public expression of airline needs. Hence, the stalemate.

Break in Deadlock Forecast

• Look for this deadlock to be broken, no matter what governmental action is taken. Arinc (Aeronautical Radio, Inc.) has completed the writing of an installation specification for civil DME. At least one airline within the next 60 days will place an order for civil DME units for evaluation.

• While Air Force, Navy and ANDB officials are strongly pushing for the conversion of ground DME to low-power distance-only Tacan, no airborne equipment development is under way that could be available and operationally acceptable within the next two years.

• Strong measures will be pushed when the Air Coordinating Committee meets to promulgate co-existence of DME and Tacan. Experts can see no reason why the military cannot be limited to between 25 to 47 Tacan channels, which would permit the continuance of DME until an orderly transition can be effected if necessary.

• Congress and others will ask questions shortly to find out under what authority the Air Force and Navy proceeded to install more than 200 Tacan ground stations in Continental U.S. in the past year. Irregularity exists in that no further expansion of either system was to be undertaken until a resolution of the hassle was reached.

One thing is sure, if the military will not compromise and the ACC is split, President Eisenhower will be asked to break the deadlock. The Department of Commerce and CAA will make no public statement until ACC has had a "go" at it. But there is a strong undercurrent in the civil aviation side of government: If military cooperation and compromise cannot be gained in orderly fashion, higher authority will be sought.

341 DMEs in Operation

It was brought out at the appropriations hearings that business and private aircraft are now operating 341 airborne DMEs. About a year ago, when the controversy began, the number was just a little over 200.

Still not talked about publicly but very much alive is the significance of the interference between the radar beacon and Tacan.

Once ANDB submits technical data as requested, ACC will issue a decision within 30 to 40 days of submission.

Less colorful and controversial, but still very significant in modernization of the airways systems is the House cut of $3.5 million from the CAA request of $128,500,000. A. O. Basnight, CAA Budget Officer, said the cut would delete $1 million for personnel at radar traffic control centers needed for high-altitude control, pegged at 20,000 feet initially, and $2 million for man power needed for operation of newly commissioned facilities. The remaining $500,000 was earmarked for transfer to new quarters for technical training at Oklahoma City. ◆◆◆

House Committee Scrutinizes CAA Policy On Delegation of Responsibilities

CAA practice of appointing designees within industry to carry out inspection and examining functions on behalf of CAA came under scrutiny of the House Appropriations subcommittee. Concern over CAA possibly losing control in properly administering the Civil Air Regulations was expressed by members of the subcommittee.

CAA Administrator Charles J. Lowen informed the committee that he already was "taking a look to see that we have not delegated responsibility too far in some instances, pulling back and taking the responsibility of doing the job."

He revealed that "we have stopped all delegation of authority . . . until we have a chance to survey this."

On delegation, AMERICAN AVIATION has learned that active negotiations are being carried on for CAA to assume operating control of all military Rapcons. Severe criticism has been leveled at the beginning of the practice of delegating approach control to military.

The designee system, which elicited House query on possible conflict of interest, has been frozen at 5707 designees. CAA supplied the following breakdown:

• Medical examiners—474 in air transport; 1,306 commercial.

• General Safety examiners—private flying, 389; commercial, 743; instrument, 101.

• Air carrier examiners—flight navigator, 31; ATR, 185; flight radio, 2; control tower, 248; flight engineer, 42; aircraft dispatchers, 1.

• Engineering examiners—airframe, 156; flight test, 59; power plant, 50; manufacturers inspectors, 125.

• Others—mechanic examiners, 262; designated aircraft maintenance inspectors, 1528; parachute rigger examiners, 5.

Turbines Must Become Safer, More Reliable

SAE hears that coordination between designers and operators is 'woefully poor,' especially in formative stages.

By JOSEPH S. MURPHY

The gas turbine engine—whether it be a straight jet or turboprop—is still the one big factor on which the success of commercial jet transportation will hinge come 1959. And as such it is virtually taking over the lion's share of the agenda at aeronautical technical sessions now and for some time to come.

This situation was never more evident than last month as the Society of Automotive Engineers convened in New York for its annual east coast aeronautical conference, with close to 1,500 engineers in attendance.

• **Spearheading** a bid at that session for greater turbine engine safety and reliability, American Airlines' M. G. Beard and Frank Kolk made it quite clear that commercial operators don't entirely agree with the way these engines have been designed in the past.

The advantages of jet powerplants are not *real* but only *potential* advantages to the airlines' way of thinking, they told SAE. The real accomplishments will rest with how well airline, engine and airframe engineers do the detail job ahead.

A Two-sided Triangle

On this score they concede that airframe men have worked quite closely with engine people in the past, and have been pretty well coordinated with operators, but unfortunately the triangle is, in many cases, rather open on the third side. They contend that such coordination between engine designers and operators, particularly in the formative design stages of powerplants, has been "woefully poor" and that industry must learn to do a more realistic and better job.

As to specific engine design features, they cited containment, compressor design, surge limits and "claptrap" controls as needed improvement areas from the commercial viewpoint.

On engine containment, they emphasized that if a jet engine can contain itself, even to the extent of a burst turbine wheel, it is obvious that considerable liberty could be taken in airplane design to save weight of "overcontrol" systems.

"We know of no engine which contains a turbine wheel in itself, except our old piston friend the R3350-DA, which has wipe-off provisions in the bucket design to positively prevent a burst due to overspeed and some armor in the plane of the wheel to contain the worst of what can happen if a burst occurs at normal operating speeds," they told SAE in a paper.

• **The answer,** as they see it, lies in development of lightweight or low-inertia wheels and strong cases, with RPM being the limiting factor. The place to accomplish this is as close to the wheel periphery as possible to minimize the angle of impact. "A few pounds in the engine are worth hundreds of pounds in the airplane," they said.

Beard and Kolk also expressed favor for the shrouded compressor stator. Minor failures will become major ones in one revolution with an unshrouded stator, they warn, but with good rigid support for the inner end of the stator blades, a minor failure will stay minor. A ¼-inch bolt ingested into an unshrouded stator compressor can completely wreck it, they said, whereas the shrouded type has, in several instances, ingested a whole handful of such bolts, and kept running.

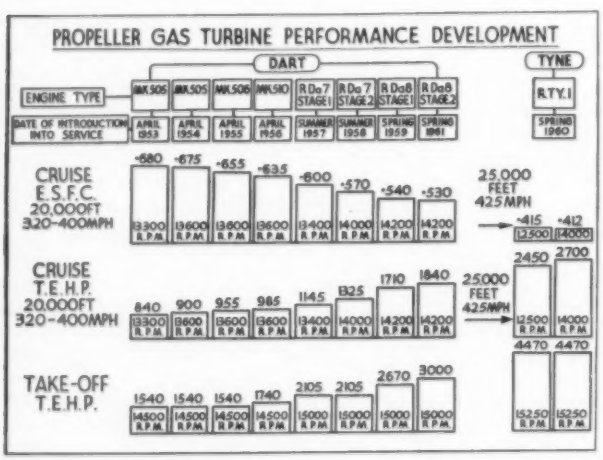
As to compressor surge limits, they pleaded with engine designers to come up with compressors that have surge limits much farther away from the operating point than they are now. As engines become more efficient, they pointed out, the basic surge limitation tends to get more severe. This results in:

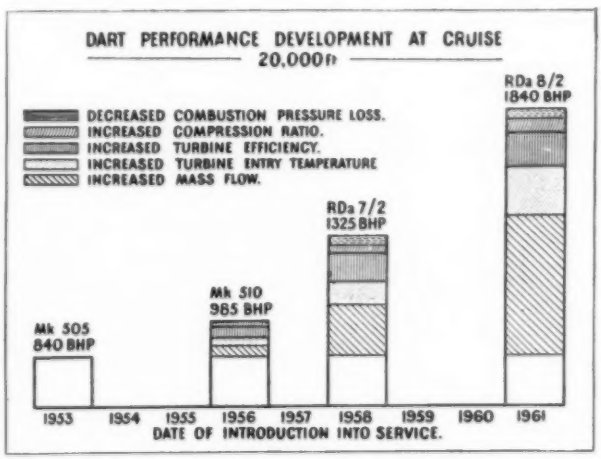
• Slow acceleration for emergency power bursts, particularly on final approach.

• High ground RPM for idle, resulting in (1) excess noise, (2) excess airflow which increases the possibility of foreign object damage and, (3) excess ground fuel flow which eats into fuel reserves and makes the flight crew jumpy at a time when they should remain quite serene.

• High holding fuel flows, which complicates aircraft design and tempts both the aircraft designer and flight crew to tighten up on fuel reserve, again giving the pilot added mental hazard and pressure when coolness and patience would pay off.

• **As to protective controls,** particularly on turboprops, they urged that manufacturers design engines that do not require "a lot of fancy claptrap" to

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INCREASED COMPRESSION RATIO.
INCREASED TURBINE EFFICIENCY.
INCREASED TURBINE ENTRY TEMPERATURE
INCREASED MASS FLOW.
Mk 505 840 BHP
Mk 510 985 BHP
RDa 7/2 1325 BHP
RDa 8/2 1840 BHP
1953 1954 1955 1956 1957 1958 1959 1960 1961
DATE OF INTRODUCTION INTO SERVICE.

How Rolls-Royce has increased Dart engine power and cut fuel consumption (left). Chart (right) shows methods used.

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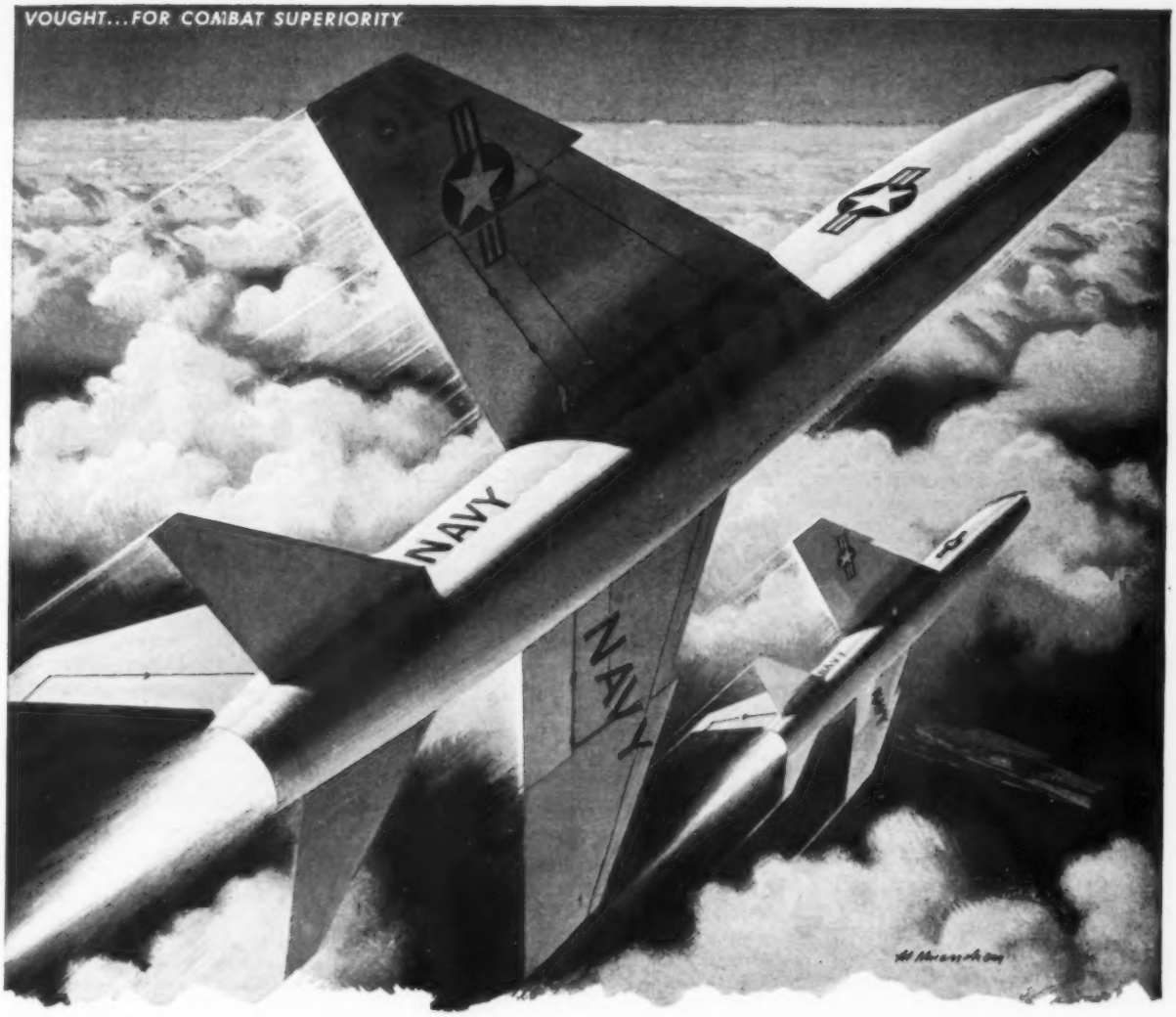

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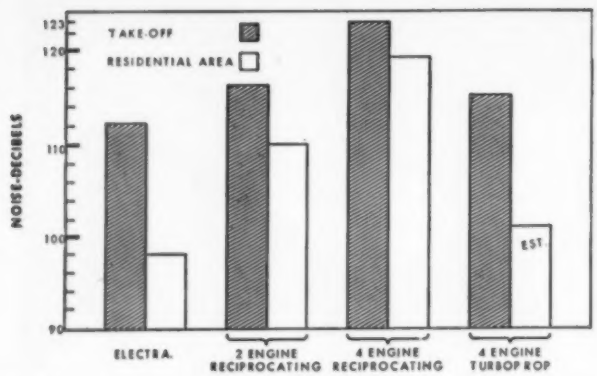
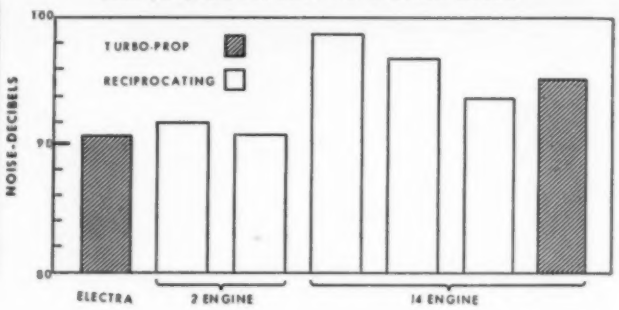




New "low taxi" RPM will cut ramp noise of Lockheed's Electra to that of present two engine planes (below, right). Takeoff and residential noise (left) falls well below that of current models.

keep the tail on the airplane in event of fuel failure in high-speed cruise. "Negative torque switches and decouplers are fine pieces of machinery," they conceded, but added "how much better it would be if they weren't so important.

An answer in part to the "beefs" of Beard and Kolk on engine design came during a discussion at the SAE session of the Allison 501 powerplant for the Lockheed Electra.

R. M. Hazen, D. Gerdan and R. R. LaMotte of General Motors' Allison Division told of a number of changes now in the mill to improve the commercial turboprop engine over that operated by the military as the T56.

New Ground-Idle RPM

For example, a "low taxi" rpm provision has been added to give a prop RPM of 737 which can supply sufficient power for all normal taxi operations. The military, SAE was told, has been satisfied with the 1,080 ground-idle and taxi RPM (prop shaft) although the reason why these services shouldn't be just as concerned as airlines about ground noise levels was not explained.

• **Tests conducted** by Allison have confirmed that, even with a reduction from the military's 1,080 RPM to the 970 RPM provided by a commercial 13.54:1 gear ratio, noise levels would still be undesirable around passenger loading ramps. The new "low taxi," which will be operated by cockpit switch selection, reduces this noise to present commercial transport levels (see charts), according to Allison.

As further proof of the reliability of its product, Allison reported the results of a series of ice ingestion tests on the 501 engine in which artificial hailstones ranging from ½ to 3 inches in diameter were "fired" into the inlet duct of an engine running at top speed, at velocities of 200, 300 and 425 mph. No damage was incurred even when 1½- and two-pound charges were muzzle-loaded onto a 3-inch ball and fired in one shot, although the duct had some sizeable dents.

Allison is also conducting a program of tests with the National Advisory Committee for Aeronautics to come up with the simplest and lightest means of inerting the hot parts of the 501 engine for improved crash fire safety. Such provisions may be added to the Electra if found to be fully effective and if asked for by the airlines.

The Electra's engine and prop combination, in addition to electro-mechanical synchronization, will also feature propeller-phase synchronization, SAE was told. This arrangement, which controls the timing of prop "beats" against the side of the fuselage, is expected to bring about a major reduction of cabin noise in the turboprop transport.

Propeller Noise Problem

• **As England's Rolls-Royce, Ltd.** views it, the matter of propeller noise is one of the great difficulties of really high-speed turboprop aircraft, chief development engineer D. P. Huddie told SAE.

Some years ago, he said, Rolls-Royce conducted fairly extensive tests with Vickers-Armstrongs on the Viscount which showed that by far the most important contributing factor to noise was the true helical tip Mach number of the prop blade. As a result, R-R came to the conclusion that to maintain the Viscount's noise levels in its successor, the Vickers Vanguard, cruise helical tip Mach number on the RB-109 Tyne engine would have to be held to Mach 0.85.

As an example of Rolls-Royce's success in applying development experience from one engine model to another, Huddie pointed out that the Tyne's high pressure compressor and turbine are an actual scale reproduction of corresponding components of its larger Conway by-pass engine. The low-pressure compressor is also a scale, at a different ratio, of the Conway's low-pressure compressor and the three-stage low-pressure turbine is based on that used in later Dart engine models.

Huddie reported that since its first running in April 1955, the RB-109 Tyne has already completed a 150-hour test using type-certification test schedules at design-flame temperatures. He said also that R-R is about to fit turbine-blade cooling in its production Avon engines for military use and that this feature has already been incorporated in the Conway. In all, the company has completed a total of more than 4,000 hours of engine operation with air-cooled turbine blades.

As to turbine engine reliability, Rolls-Royce estimates that on January 1, 1956 its Dart engine had accumulated some 739,000 airline hours of flight service. Since 1953, when operations began, its overhaul period has increased from 400 to 1,050 hours and average unscheduled removals per 1,000 hours has been 0.288. However, the average for all operators during the year 1955 was 0.182 removals per 1,000 hours, which all adds up to a remarkable record by piston engine performance standards.

2,000-lbs. Weight Saved

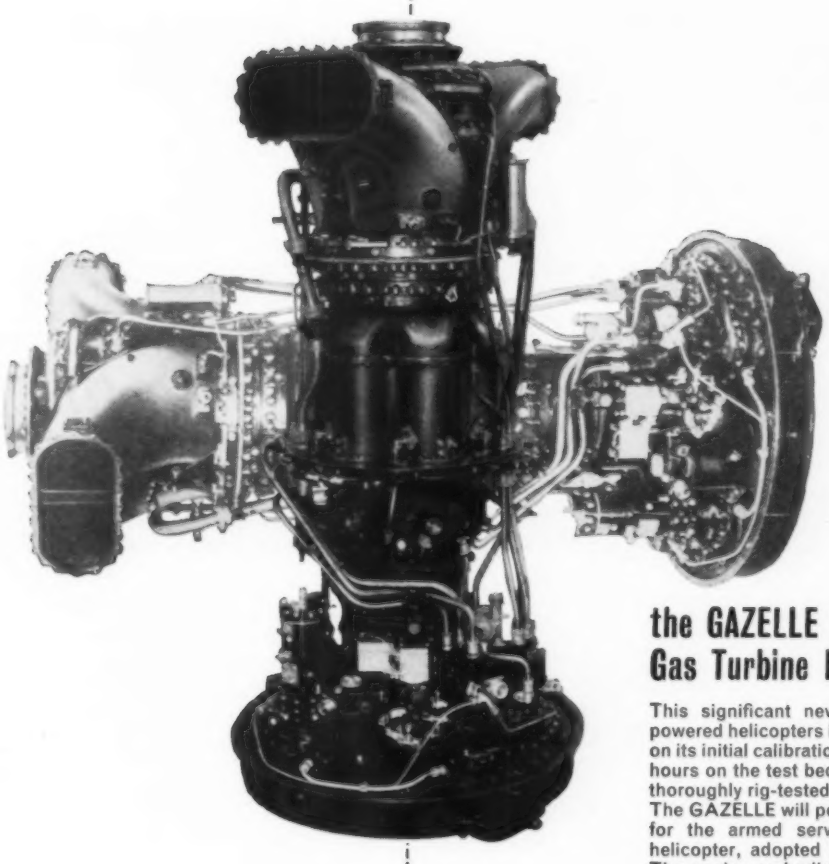
• **A. J. Penn, chief engineer** of the Aero Gas Turbine Division of Napier & Son, Ltd., told the SAE session that the replacement of the piston engines in Convair 340 transports with the Napier Eland turboprop engine results in an immediate weight saving of 2,000 pounds.

Using the Eland N.El.6 rating (3,500 equivalent horsepower) the Convair's maximum gross weight is increased from 47,000 in the standard 340 to 53,200 pounds, assuming a typical cruise power of 1,750 shp. Under these conditions, Penn said, the Eland conversion can maintain the maximum payload of 12,900 pounds up to about 1,000 miles stage distance. For the piston version, he points out, payload falls off to 10,000 pounds for the same distance.

And the stage speed for the turboprop is 290 mph compared with 240 at a stage distance of 1,000 miles.

• In its original N.El.1 rating, the Eland was designed for a takeoff power of 3,000 ehp with a 7-to-1 pressure ratio, specific fuel consumption of 0.625 pounds per ehp per hour and specific

Selected for the British Navy and the British Air Force



the GAZELLE 1,260 s.h.p. Gas Turbine Engine

This significant new free-turbine engine for gas turbine-powered helicopters is the first ever to exceed brochure values on its initial calibration runs. It has already completed over 150 hours on the test bed—and the turbine and compressor were thoroughly rig-tested before the first engine build !

The GAZELLE will power the twin rotor Bristol 192—designed for the armed services—and the Westland S.58 Wessex helicopter, adopted by the Royal Navy.

The engine embodies a highly efficient small diameter axial compressor and the safe, simple Napier automatic control system. It can be mounted vertically or horizontally, and its application need not be confined to rotary wing aircraft.

Because of the engine's light weight and small size, the installation position in relation to the aircraft's C. of G. is not of vital importance—thus a more flexible disposition of variable cargo and fuel loads is made possible.

The power of the GAZELLE is still being developed. 1,260 s.h.p. and upwards—from the low weight, compact GAZELLE!

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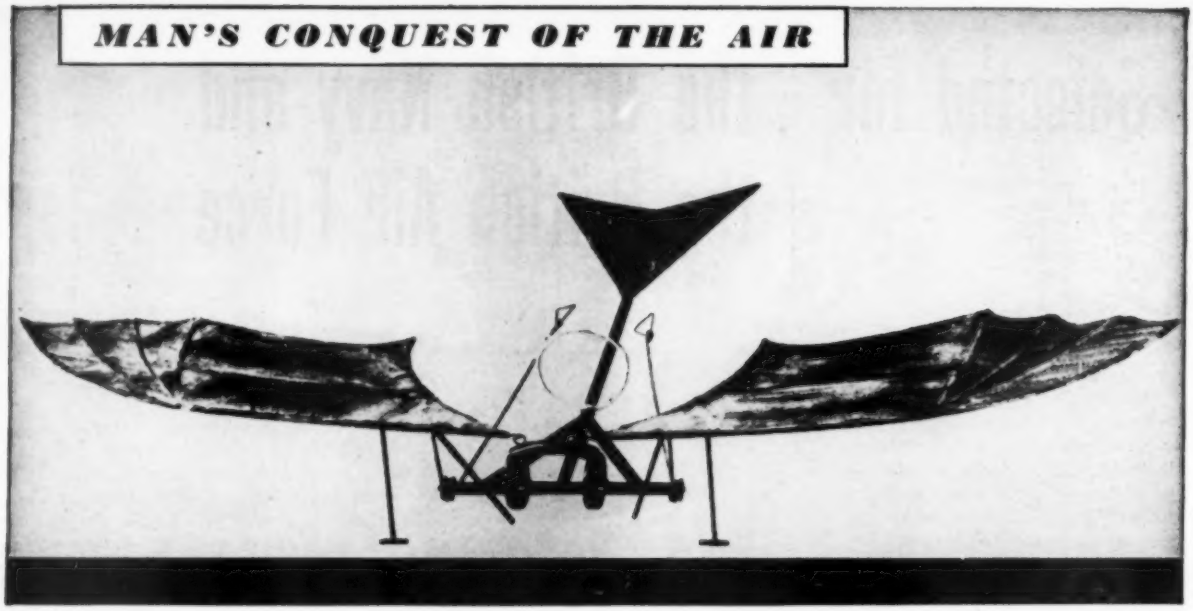
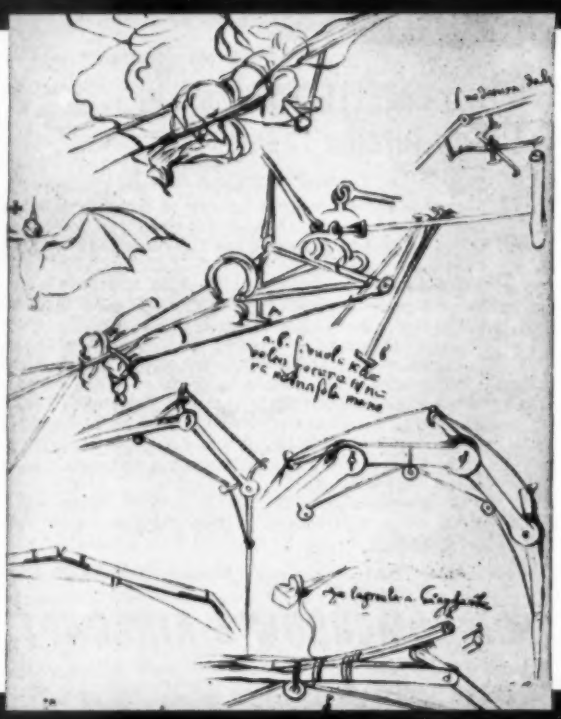
MAN'S CONQUEST OF THE AIR



First Plans for Mechanical Flight



"If I find that this instrument made with a screw be well made – that is to say, made of linen of which the pores are stopped up with starch – and be turned swiftly, the said screw will make its spiral in the air and it will rise high."

These are not words of a visionary but the careful notes of the man who gave the world its first detailed plans for mechanical flight – Leonardo da Vinci. Over 400 years ago he made a careful scientific investigation of the mechanics of bird flight, planned in detail the helicopter and parachute, and constructed many test models of flying machines. Always seeking improvements, he died with his work unfinished.

"There shall be wings!" da Vinci declared. "If the accomplishment be not for me, 'tis for some other." Today we have those wings and like da Vinci, keep trying to improve the ways we fly. With the same spirit ESSO research continues to supply today's new and better aircraft with new and better aviation petroleum products.

It pays to ask for

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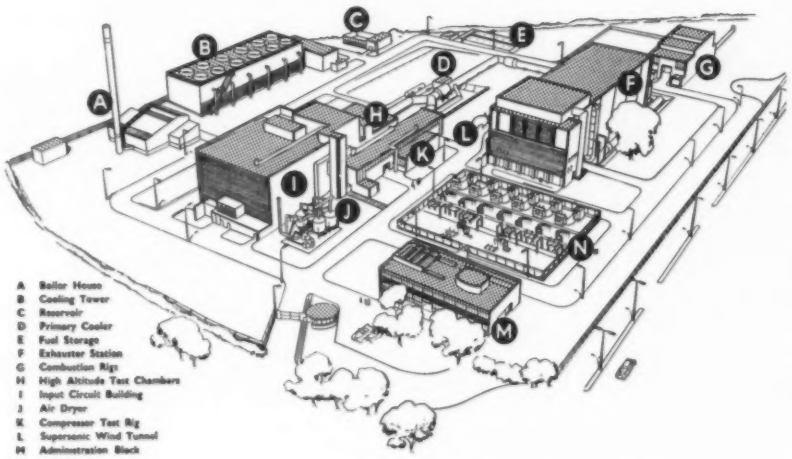
weight of 0.525 pounds per ehp. For a typical cruise at 25,000 ft. and speed of 350 mph, SFC is 0.51.

This engine, SAE was told, has since developed into the N.El.6 having the 3,500 ehp rating at the same pressure ratio. Specific fuel consumption has dropped to 0.595 and specific weight to 0.49, and this has been realized with only a change in turbine blade material.

Penn also disclosed development of a 4,200 ehp Eland with an 8-to-1 pressure ratio, SFC of 0.56 and specific weight of 0.43 pounds per ehp. This engine, the N.El.5, has an air-cooled turbine and is interchangeable with the N.El.1 and N.El.6 models. SFC for this version, assuming cruise flight at 400 mph, improves to 0.44 pounds per ehp per hour, the Napier official said. ◈◈◈

Rolls-Royce Building $10.7-Million Supersonic Engine Test Facility



Layout of 13½-acre Rolls-Royce high altitude engine test facility.

Rolls-Royce is building a $10,696,000 high-altitude supersonic engine test facility at Derby, England, to be completed by mid-1957, with full-scale testing slated to start in January 1958.

Total power requirement for the plant will be 142,000 hp but with normal running 80,000 hp is estimated to be required, consuming about 60 megawatts. The electric power will be stepped down through a sub-station from the 33 kv National Grid.

Facilities will consist of: two high-altitude test chambers; a 15,000 hp compressor test rig; a Mach 4 supersonic wind tunnel; and two combustion test rigs. One of the high-altitude test chambers is to be for turbojets and the other for either turbojets or turboprops. Each consists of a tunnel 75 feet long and 12.5 feet inside diameter made in nickel-steel to allow for large temperature range. Industrial closed-circuit television will be used for observation.

• **In the propeller** test cell an engine shaft extension will pass through the front wall to connect with measuring dynamometers. An axial compressor of 157,000 cu.ft./min. capacity with refrigeration/drying/heating capacity capable of equivalating conditions up to 70,000 ft. and 1,500 mph will feed direct to the engines. Exhaust gases will be cooled to 40°C before being discharged, through silencers, to atmosphere.

The exhauster station will house six compressors which will supply air to other facilities while exhausting the main cells. For example, they will be used to supply high pressure air for the combustion test rigs. This supply can be pre-heated to 840°F by injecting fuel into the stream and burning it. The low-pressure rig will be supplied through the main exhauster plant, with pre-heating facilities.

• **A 15,000-hp air turbine** will be used to drive the compressor test rig, the turbine being motivated from the main compressor air supply.

The high supersonic wind tunnel will have a three-feet-square working section and is intended to simulate flight speeds up to Mach 4 at very high altitudes. It is intended for study of models of nacelles, intakes etc. and in addition to the usual balances and pressure-measuring equipment, will have a Schlieren shockwave pattern apparatus.

Rolls-Royce says that the plant has been designed so that two or four facilities can be operated simultaneously.

Esso Executive Predicts $10 Billion for Research

Technology will come into its own as an important "product" within the next ten years, according to E. Duer Reeves, vice president, Esso Research and Engineering Company, who predicted that by 1966 $10 billion annually will be spent for industrial research. Speaking before the Institute of Radio Engineers national convention, Reeves pointed out that in modern industry research organizations are regarded as operating departments.

Old-timers, he said, who are used to old-fashioned research activity, operating behind closed doors in an atmosphere of academic mystery, would today "have the uneasy feeling that they are in the office of an industrial company turning out a product."

The trend today is toward highly organized teams that focus research attention on problems that can be translated into a commercial product. Their raw materials are scientific fundamentals. Operations research studies determine what direction the activity needs. Backing up the work are long-range plans and budgets, building facilities, customer surveys and sales organizations. Emphasis is on management and communications.

Next step in the evolution will be emergence of research organizations of the "non-captive" type, said Reeves. Operating as independent companies, the new type of research operation will market their services and compete for business.

Industrial research has been tripling in size every ten years, and by 1976 will be a $20-billion industry employing a million people, he believes.

Result of these changes will promote a new era of industrial growth, since it will increase our capacity for new discoveries, Reeves said. Cost of the new technology will be lowered by efficient operation and whole new industries will be opened up by availability of the technological sciences on the open market, he declared.

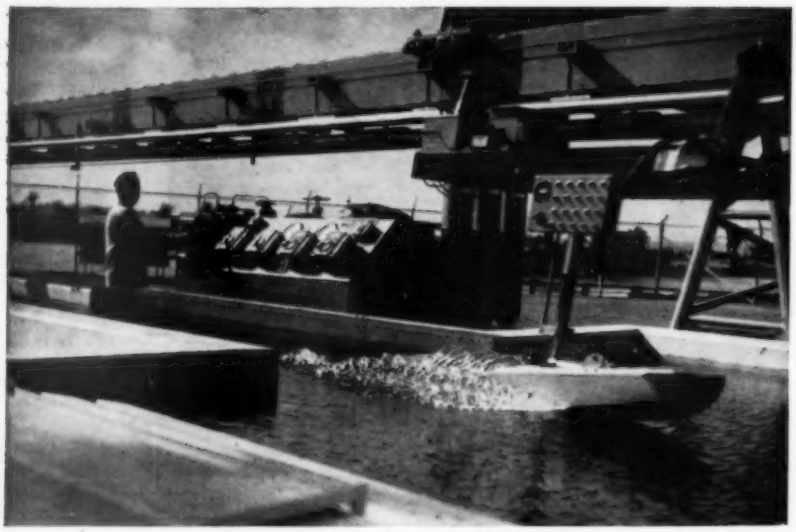
New Weather Research

Four major U.S. airlines are providing a substantial share of financing for a $150,000 four-year long solar research program at the University of Colorado to increase the accuracy of weather forecasts.

The new research, under the direction of Dr. W. O. Roberts, who heads the University's High Altitude Observatory, is aimed at bettering the long-range aspects of forecasting.

Airlines contributing to the project are Continental, TWA, United and American.

Convair's Seaplane Towing Tank



First unit of Convair-San Diego's proposed $800,000 hydrodynamic laboratory—a model seaplane towing tank—is expected to save time and reduce costs of developing advanced-type seaplanes. It was dedicated formally this month.

Biggest towing tank on the West Coast, the new facility will largely eliminate the necessity of Convair engineering personnel making numerous cross-country trips to towing tanks on the East Coast for seaplane research, says B. F. Coggan, manager of Convair-San Diego.

When complete, it will be 700 feet long with a 100-foot-square turning basin in the center. To prevent gusts or inclement weather from interfering with tests it will have a wind-proof structure.

• **Presently,** there are two 300-foot towing sections, each 12 feet wide and six deep. The center turning basin will permit studies of maneuvering problems and can be adapted to study submarine as well as surface vessel designs.

Tests are conducted by suspending a model from a carriage that runs on a double overhead rail. The model is towed at a predetermined speed up to 68 mph. As the hull slices through the water, data recording devices mounted on the carriage collect information on performance. Air loads over the wings are also recorded.

The tank will also permit underwater ballistics studies and the investigation of supersonic aircraft shapes, with water being used as a test fluid instead of air.

Special devices in the turning basin will produce artificial waves and "mixed sea" conditions for rough water studies.

The overhead rail consists of two solid stainless steel rods mounted on "V" blocks two feet apart. The rails are suspended about three feet over the water level in the tank, on beams and tubular steel framework towers.

• **The carriage** is operated by a 30-hp constant-speed electric motor that drives three hydraulic pumps. A stainless steel cable, running the length of the overhead rail and connected to a drum driven by hydraulic pumps, pulls the carriage, which in turn drives the model.

new! PATTON oil seal puller

SAVE TIME—MONEY

New oil seal puller does the job quickly and easily without damage to parts and castings.

The Patton Oil Seal Puller was designed to eliminate the waste of time in removing oil seals. In addition to the time-saving advantages, this precision tool prevents scoring and damage to the metal seat that holds the oil seal. The complete set consists of six expanding heads and two hammers. The size range, from 3/8" to 4½", handles all oil seals in general use. Larger or special sizes may be custom made for specific requirements.

Originally designed for the Armed Forces, the Patton Oil Seal Puller is now used by maintenance and repair shops in the following industries: aircraft, automotive, agriculture, construction, marine and oil fields. In fact, wherever machinery and equipment are repaired, Patton Oil Seal Pullers save costly man hours and prevent unnecessary damage to component parts.

GUARANTEED • All parts of the Patton Oil Seal Pullers are fully guaranteed by the manufacturer. Each item is thoroughly tested before shipment. Only high quality tool steel is used in the expanding head. Small nicks in the lips of the expanding head, caused by improper care, do not greatly impair the efficiency of this tool.

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An American Aviation Publication

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Timetable for the new AIR CRUISERS INFLATABLE ESCAPE SLIDE
Open the door aft of wing.....2 seconds
Elongate slide if nose wheel has collapsed.....1 second
Release slide from pack.....1 second
Inflate.....8 seconds
50 occupants evacuate plane.....up to 65 seconds

Problem: in an aircraft emergency, how to evacuate the plane in 90 seconds or less — the estimated time that occupants are physically capable and the crew able to lead the escape.

For AIR CRUISERS, construction of an escape slide to meet this exacting need became an impressive challenge involving eleven major design objectives.

Recent Air Force tests show how capably the challenge was met. "Inflatable Escape Slide — Type 10" promises to be another major achievement in a field in which AIR CRUISERS has won first place: *aircraft survival equipment for the airlines and Armed Services.*

AIR CRUISERS, the only manufacturer which conducts continuous research in survival equipment, is America's most experienced fabricator of inflatable rubber and rubberized materials.

Contributing to this specialized science is another division of The Garrett Corporation — AiResearch. From AiResearch laboratories and engineering come integrated components for automatic inflations which are the world's most advanced in design and quality... sharing in the progress toward "Survival Unlimited!"

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AIR CRUISERS DIVISION

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A major weapon at CONAD's call is *Nike*, the Army's supersonic rocket, built by the Douglas-Western Electric team, and now guarding key cities. Radar-guided from ground stations, Nike carries a powerful warhead, can track and destroy bombers more than 20 miles off—regardless of evasive action.

Nike Missile—
built by Douglas

Defense is everybody's business. Guided missiles like the Army's Nike are marvels of engineering skill, but they cannot operate without crews of trained personnel. All branches of the Armed Forces depend on young men and women who agree that "defense is everybody's business."

Depend on *DOUGLAS* **First in Aviation**

T-33 Trains Jet Pilots of 19 Nations

Lockheed's 600-mph aircraft likely to retain world leadership for next five years; nearly 5,000 produced since 1948.

By ANTHONY VANDYK

Nine out of 10 of the western world's jet pilots have trained in the Lockheed T-33. Furthermore, for next five years at least, the 600-mph aircraft will remain the prime jet trainer in most parts of the globe.

In production at Burbank and Palmdale, Calif. since March 1948, the T-33 is likely to remain on the line at Lockheed for another three years. To date nearly 5,000 T-33s have rolled off the company's assembly lines.

Lockheed, however, is not the only T-33 production source. Canadair Ltd. started delivery of a license-built version of the aircraft in March 1953 and has since produced over 550. In Japan, Kawasaki Aircraft Co. has just started delivering license-built T-33s. Thus T-33s are built in Japan, Eastern Canada and California.

The trainers are used in the following foreign countries as well as by the USAF, U.S. Navy and Marines: Belgium, Canada, Chile, Nationalist China, Colombia, Cuba, France, Greece, Italy, Japan, the Netherlands, Peru, Philippines, Portugal, Spain, Thailand, Turkey and Venezuela. Other nations are negotiating to acquire T-33s.

• **Why has the T-33** had such a success? Because it is easy to fly yet has fighter performance and speed. The tandem arrangement of seating is preferred by most instructors. It enables the student to receive instruction in surroundings almost identical to those in which he will find himself while flying a combat aircraft.

Moreover, the absence of mental diversion, such as might be caused by the instructor's presence immediately at his side, enables the student to acquire more quickly the alertness and independence necessary in fighter pilots.

• **As a safety feature,** a student lock-out control and telltale indicator light-box may be installed. Operation of an override button permits the instructor to override the student's control. A reset button returns the controls to normal operation. The individual indicator lights show the instructor when the tabs, wing flaps or dive flaps are being operated.

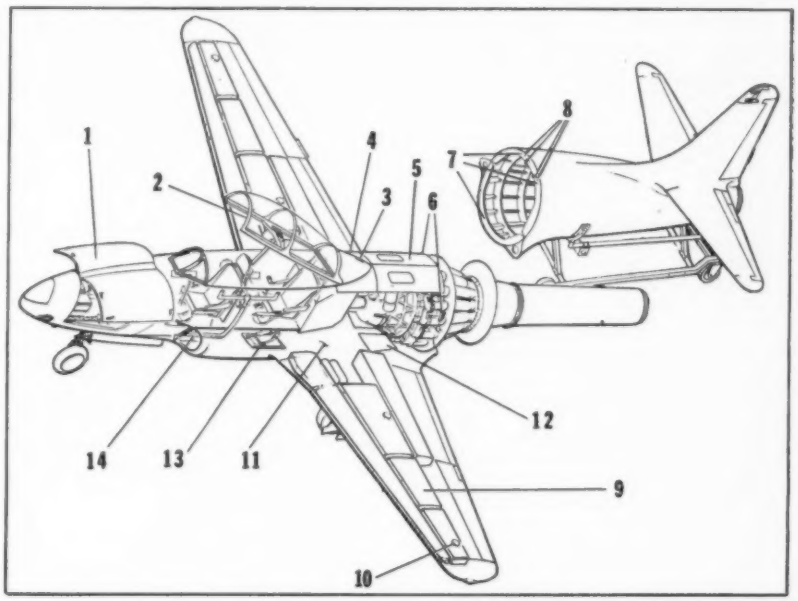
Derived from the venerable F-80 fighter, the T-33 can perform missions other than training. It may be used for target-towing, missile chases, photography, experimental ordnance and electronic testing. The prime purpose of the T-33, however, is training.

Typical fighter missions such as combat, interdiction, gunnery, rocketry, dive-bombing and ground support may all be accomplished with the T-33 because of the aircraft's ability to carry various armament loads without major alteration of the basic airplane.

• **Armament** comprise two, four, six or eight M-3, .50-caliber machine guns in the nose. Bombs or napalm tanks may be carried on each of the wing-tip tank racks. The sway brace assemblies will accommodate bombs from 100 to 1,000 lbs. weight, and deflector assemblies are provided to keep fins of 100- or 250-lb. bombs from striking the wingtip trailing edge.

Provisions are installed to permit attachment of underwing pylons for carrying two bombs of up to 1,000 lbs. each or two sets of four 5-in. HVAR air-to-ground rockets. A pod, containing either 12 2.75-in. air-to-air rockets or two .50-caliber M-3 guns, may be installed in each mid-wing position.

The Lockheed and Kawasaki-built versions of the T-33 are powered by the Allison J33-A-35 turbojet of 5,420 lbs. thrust. This engine was recently cleared for a between-overhaul life of 1,700 hours by the USAF. The Canadair-version of the T-33 uses the 5,100-lb. Rolls-Royce Nene 10. The trainer's performance may be improved by fitting two 1,000-lb. thrust-assisted take-off



Ease of servicing is a particular feature of the T-33 as shown in the above drawing:

(1) Armament compartment doors provide waist-high access to armament, batteries and electronic units.

(2) Hinged canopy can be removed when extensive servicing of the flight station is desired.

(3) Fuel tank cover for access to fuselage bladder cell.

(4) External electrical power dual receptacles are provided at the right wing-fuselage junction for connection of battery carts.

(5) Plenum chamber doors permit access to the engine, hydraulic reservoir and water alcohol tanks.

(6) Engine is suspended from three quickly detachable mounts.

(7) Three-point tension joint in fuselage to allow quick removal of engine.

(8) Controls service joints to speed removal of aft fuselage.

(9) Fuel bladder cells are accessible by removing lower wing panels.

(10) Filler caps are located to provide ground access for refueling.

(11) Access to hydraulic units in main landing-gear wheel wells.

(12) Access doors to engine accessories, aileron booster unit, dynamotor, etc.

(13) When dive brakes are down, access is provided to hydraulic units, fuel booster pumps and drains.

(14) Oxygen filler valve is located to provide replenishment from a waist-high position.

T-33 Specifications

Basic Demensions

Span (no tip tanks)	37 ft. 6 in.
Span (with 230 gal. tip tanks)	42 ft. 9.94 in.
Length	37 ft. 8.625 in.
Height	11 ft. 8 in.
Landing gear tread	8 ft. 9 in.
Landing gear wheel base	14 ft. 1.9 in.
Tire size, main wheels	26 x 6.6 in.
Tire size, nose wheel	22 x 7.25—11.50 low profile

Areas

Wing (including projected fuselage area)	234.8 sq. ft.
Ailerons (both)	17.5 sq. ft.
Wing flaps (both)	30.7 sq. ft.
Dive flaps (both)	5.8 sq. ft.
Horizontal stablizer	34.8 sq. ft.
Elevators (both)	8.7 sq. ft.
Vertical fin	22.1 sq. ft.
Rudder	5.3 sq. ft.

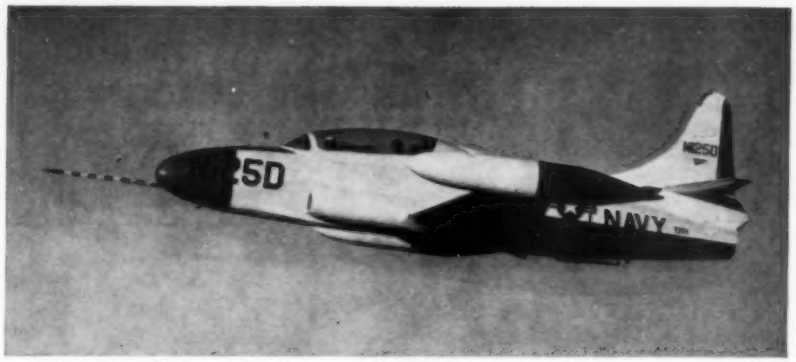
Fuel Data

Fuel Capacity:	
U.S. Gallons in internal tanks	353
U.S. Gallons in centerline mounted tip tanks	460
Fuel De-icing fluid:	
U.S. Gallons in a fuselage tank	5

Weights (Pounds)

	Without Tip Tanks	With Tip Tanks
Weight Empty	8322	8322
Crew (2)	460	460
Fuel	2295	5285
Droppable fuel tanks, 230 U.S. Gal.(2)	....	397
Fuel de-ice	33	33
Cal. .50 Guns (2)	146	146
Cal. .50 amm. 600 rds.	180	180
Life rafts (2) & Portable oxygen bottles	40	40
Oxygen	35	35
Miscellaneous*	120	120
Gross Weight	11,631	15,018

*Unusable fuel, unusable oil, gun sight and gun camera



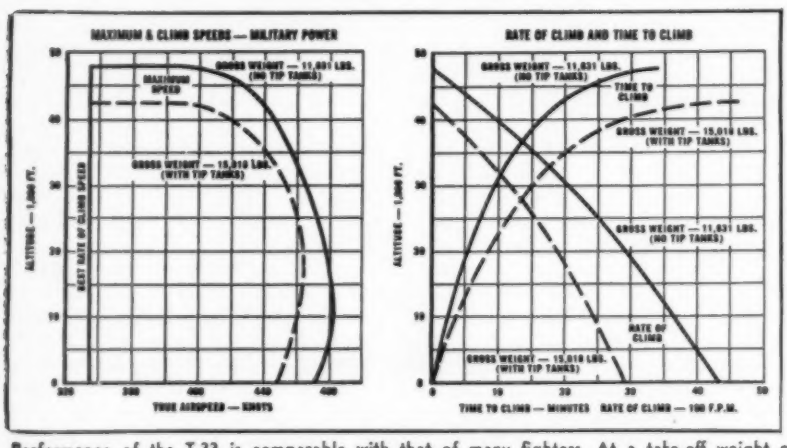
Navy's T2V-1 SeaStar is latest version of T-33. Production is likely to run until 1959.

units on the fuselage belly.

• **As shown** in the accompanying illustration, the T-33 is designed for easy servicing. Normal refueling time is 20 to 30 minutes, using one fuel truck. Rearming time is about four minutes per gun. About four hours are required to give the T-33 its 100-hour major inspection. A normal engine change, including transfer of accessories to the replacement engine, takes about six hours although a quick engine change has been carried out in less than ten minutes.

The T-33 has not been in production for eight years without improvements having been made to the design. Latest version is the T2V-1 SeaStar navy trainer. Designed for carrier operation, the T2V-1 is capable of withstanding a landing "sink" rate of 16 ft. per second (against nine f.p.s. for the T-33) and its landing gear withstands five times the impact load of the T-33's gear. Its wing joints are designed to handle 59,000-lb. loads in contrast to the 20,000-lb. loads of the T-33.

Now firmly established in the trainer field, Lockheed plans to consolidate its position with a trainer version of the F-104 which will undoubtedly be the world's fastest multi-place aircraft. The success of the T-33 and promise that the TF-104 holds might well encourage a punster to change the company's well-known slogan to "Look to Lockheed for Training Ships." ◈◈◈


MAXIMUM & CLIMB SPEEDS — MILITARY POWER
GROSS WEIGHT — 11,631 LBS. (NO TIP TANKS)
MAXIMUM SPEED
GROSS WEIGHT — 15,018 LBS. (WITH TIP TANKS)
BEST RATE OF CLIMB SPEED
ALTITUDE — 1,000 FT.
TRUE AIRSPEED — KNOTS
RATE OF CLIMB AND TIME TO CLIMB
GROSS WEIGHT — 11,631 LBS. (NO TIP TANKS)
TIME TO CLIMB
GROSS WEIGHT — 15,018 LBS. (WITH TIP TANKS)
GROSS WEIGHT — 11,631 LBS. (NO TIP TANKS)
RATE OF CLIMB
GROSS WEIGHT — 15,018 LBS. (WITH TIP TANKS)
ALTITUDE — 1,000 FT.
TIME TO CLIMB — MINUTES
RATE OF CLIMB — 100 F.P.M.

Performance of the T-33 is comparable with that of many fighters. At a take-off weight of 15,528 lbs. and with 813 gallons of fuel it has a combat range of 1,140 nautical miles. Cruise altitude is 38,000-42,000 ft.

Contracts

Recent contract awards announced by Commerce Dept. are listed below. Unless otherwise noted, contracts are with Air Force:

Grumman Aircraft Engineering Corp., Bethpage, N. Y., $6,227,417, inspection and repair of 94 SA-16 and 14 UF-1G aircraft.

Convair Div., General Dynamics Corp., Ft. Worth, Tex., $4,153,852, maintenance of C-54s.

Beech Aircraft Corp., Wichita, Kans., $3,694,116, T-34B aircraft, design data, test drawings, spare parts.

Contracts announced by companies:

Westinghouse Electric Corp., Baltimore, Md., $22,750,000 Navy contract for production of Aero-13 fire control system to be installed in Douglas F4Ds.

Continental Aviation & Engineering Corp., Detroit, Mich., $9,312,766 for J69-T9 gas turbines for Cessna T-37s.

Hiller Helicopters, Palo Alto, Calif., $3.5 million Army contract for H-23C helicopters.

General Electric Co., Naval Ordnance Dept., Pittsfield, Mass., contract in excess of $5 million for development and production of radar antennas for use in tracking guided missiles.

Avien Inc., Woodside, N. Y., $4.5 million, engine temperature gages for F-86Ds.

Servo Corp. of America, New Hyde Park, N. Y., $1,111,925 Navy contract for dead reckoning tracer navigation systems.

Litton Industries, San Carlos, Calif., $5,647,950, electron tubes.

American Phenolic Corp., Chicago, $1,974,099, bombing navigational system for testing.

The Glenn L. Martin Co., Baltimore, $28,545,120, spares, special tools, technical data for B-57.

General Electric Co., electronics div., Syracuse, N. Y., $2,500,000, research on production refinement program of semi-conductor devices.

Convair Div., General Dynamics Corp., San Diego, $1,703,000, facilities for design, engineering and testing of missiles.

Aerojet General Corp., Azusa, Calif., $1,285,000, facilities for research and development of rocket engines, work to be done at Sacramento.

North American Aviation, Los Angeles, Calif., $40 million, new version of F-100F.

Douglas Aircraft Co., Long Beach, Calif., $22,685,705, for B-66 conversions; Douglas-Tulsa, $6,377,000, development of C-132.

Lockheed Aircraft Service, Burbank, Calif., $4,545,537, servicing of B-50s.

Ford Motor Co., Dearborn, Mich., $9,386,000, purchase and installation of production facilities; $2,563,757, construction and installation of four test cells.

Continental Aviation & Engineering Corp., Detroit, $9,312,766, production tooling for J69-T-9 engines, and $1,360,592, procurement of J69-T-9s.

Kearfott Co., Inc., Little Falls, N. J., $2,663,989, indicators, gyros, controls.

General Electric Co., Dayton, O., $1,737,195, generators and control panels.

Convair Div., General Dynamics, Ft. Worth, Tex., $4,016,000, facilities to support B-58 production; B-52 components.

As flight systems have become more complex, speeds higher, space and weight-saving more valuable, the increasing rate of technical progress in the aircraft industry has created a serious problem:

Keeping its products up to top level of operational effectiveness—and in the air—has become a major responsibility of the prime contractor.

Martin has been working on that problem for many years; and the result is a new kind of service organization and systems method which now provides for the maintenance of all Martin products—from the company's assembly lines to operational flight lines anywhere in the world—at peak effectiveness and with maximum availability.

It is service on a *systems* basis, and already it's setting a new pace in the industry.

MARTIN

Major Airport Expansion Programs Make Good Progress with Civic Support

Major planning and improvements at major terminal airports have gotten off to an accelerated start in 1956.

In San Diego, a comprehensive survey has recommended construction of a new air carrier field to replace Lindbergh Field.

A proposal to expand the Navy base at North Island for joint Navy-air carrier use has brought a flat rejection from the Navy. Because of the unusual terrain of the area, the only other possible site is more than 40 miles from the city. In order to solve the knotty military vs. civil issue, CAA Administrator Charles J. Lowen has referred the problem to the ACC Airport Use Panel which will begin public hearings late in June.

In Los Angeles, a concerted drive is on to sell voters on the vital importance of approving a $59-million bond issue.

In St. Louis, a $7-million terminal building and area was officially dedicated.

Growing congestion and safety hazards arising from the mixture Navy, Air Guard and McDonnell jet aircraft operations with civil traffic have resulted in a proposal to establish a separate military airport in the area. A proposed site in St. Charles County has been criticized sharply by citizens' groups. Here, too, the Airport Use Panel has stepped in—and will explore the situation sometime in June.

In Minneapolis-St. Paul, Northwest Airlines has concluded an agreement with the Airport Commission to establish new multi-million headquarters at Wold-Chamberlain instead of Holman Field.

Here are the details:

•**San Diego**—Leigh Fisher & Associates, concluding a major study of complex airport and airspace problems, has recommended to the City Fathers the eventual abandonment of Lindbergh and Montgomery airports and creation of a new facility. San Diego has one of the most pressing air traffic control problems because of the mingling heavy Navy air operations; Convair, Ryan and Solar flight test activities; air carrier and other civil flying.

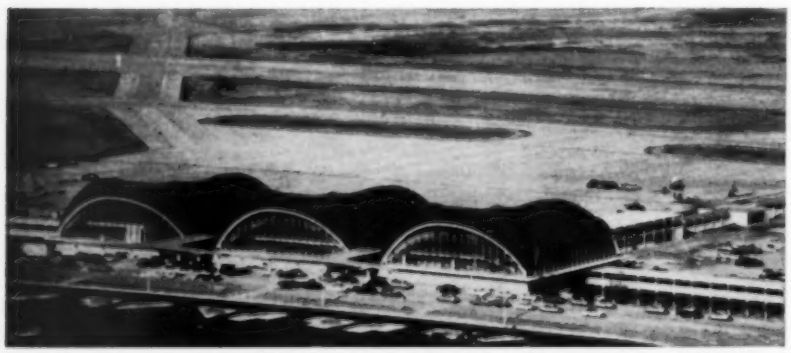
In his recommended program, Fisher said "joint use of the airspace and general approach patterns to the various airports is an absolute necessity." While three separate solutions have been handed to municipal officials, Fisher has endorsed the following action:

1. Abandonment and sale of Montgomery Field for industrial development with proceeds to be used for financing development of civil airport facilities on North Island through arrangements with the Navy for necessary acreage and *permanent* joint use privileges. On a dredge-filled site, parallel runways should be developed in alignment with the two VOR sites in the area to permit straight-in approaches. Civil terminal area would be created on the remainder of the filled land, providing an access road through Coronado.

2. Lindbergh Field should be scheduled for a phase-out, with arrangements made for facilities for Convair and Ryan aircraft to be cross-bay barged.

3. Tijuana International Airport and North Island should be set up to serve as alternates to each other. Tijuana, located on the U.S.-Mexican border, should have a U.S. terminal building, apron and taxiway on the U.S. side. Segregation of building areas on either side of the border, Fisher noted, would establish a joint U.S.-Mexican operation similar to a joint civil-military operation with building areas on the opposite side of the field. Subject to international agreement, the U.S. side would be utilized as a non-scheduled civil base.

If San Diego adopts Fisher's proposal the permanent civil and military airports in the area would stack up as follows: *Naval Air Station Miramar*, Navy operations only; *NAS North Island*, Naval utility, transport and supply base and civil airline, compatible civil transient, and manufacturing aircraft airport; *Proposed South Bay Seadrome Base, Brown Field*, and *Ream Field*, naval operations only; *Tijuana* civil airport for U.S. airline alternate



Open for business is the new $7 million terminal facility at St. Louis-Lambert Field, following dedication ceremonies earlier this month. Although it has more than quadruple the space available in the old building, plans are in the works for expanding the new facility by 1960.

Proposed new Los Angeles Airport will look like this from air if hefty $59 million bond issue is approved by voters. All but about $11 million is earmarked for the International facility, which calls for (A) converting present passenger section to freight use; (B) will be site of new administrative center for passenger service, shops and concessions; (C) new hangars; (D) new runway layout.

and possibly as non-scheduled base; *Gillespie Field,* permanent civil non-scheduled airport. Two new airports—one north of San Diego and one around Chula Vista and National City are proposed for civil non-scheduled use.

Stressing the need for coordination between city, county, Navy, CAA and all other interested agencies, Fisher recommended the following division of administrative and control responsibilities: Navy, for all military airports; Harbor Commission, for development, active promotion and management of all air carrier airports. San Diego County, for all non-scheduled airports.

• **Los Angeles**—Faced with a record of previous defeats of vital airport improvement bond issues, Los Angeles has organized to tell the public the importance of passing the self-liquidating $59,700,000 bond issue to be placed before it on the June 5 primary ballot.

The Global Airport Terminal Committee, composed of top business and civic leaders, has been formed under the chairmanship of W. Herbert Allen, board chairman of the Title Insurance and Trust Company.

The committee has joined forces with county and city officials to get voters to vote "yes."

"Los Angeles can become the global air terminal of western North America if it has double the runway system, longer runways and adequate terminal facilities," the committee argues.

Bond proceeds would be divided: $49,655,000 for the International Airport, $9,520,000 for San Fernando Valley Airport and $525,000 for acquisition and development of heliports.

• **St. Louis**—Earlier this year the $7,728,000 airport terminal building auxiliary facilities were officially dedicated. The terminal building, since inception of its design, has won acclaim in the architectural world. Lambert Field has been handicapped by its old building since 1950, when it was labeled 100% overtaxed. It provided only 66,774 sq. ft. of space compared to 239,600 in the new terminal area. Fifty-two per cent of the building space in the new modern terminal is considered rentable.

Plans for expansion of the new building are already being put into effect. Built to accommodate 600,000 passengers by 1960, estimates already have exceeded that number by that period.

• **Minneapolis-St. Paul** Metropolitan Airports Commission has wrapped up a contract with Northwest Airlines whereby the carrier will move its headquarters from Holman Field to Wold-Chamberlain. The commission will erect a $15 million facility for overhaul, line maintenance shops and general offices for NWA, to be occupied in late 1957 or early 1958.

The 30-year lease to the airline is a self-liquidating one. A 76-acre tract has been selected for the base. A new administration building will be erected, key highways re-routed and ramps and runways built.

• **In addition** to these four, Dallas' Love Field is hard at work expanding its airport, with construction started on a $6.5-million terminal building and related facilities to be completed in June 1957. Working closely with the efficient Chamber of Commerce, the airlines and the passengers themselves, the building and area have been carefully designed to provide maximum comfort and streamlined passenger handling.

The terminal will be the site for the first use of moving floors to carry passengers from the terminal to the "fingers". Maximum protection from the weather is being provided between the terminal and ground transportation.

Busy Cleveland-Hopkins Airport dedicated its new $4-million terminal building late in April, and is currently completing an additional $1¼ million worth of roadways, parking lot, lighting and landscaping.

Airport Operators Council estimates that its 43 members alone have currently in process or planned $500 million for airport facilities with more than $40 million already under way.

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Dependable Airborne Electronic Equipment Since 1928

AF Will Need $1 Billion for Electronics in '57

Gen. Blake tells House Appropriations Subcommittee why $174 million over 1956 requirements is being sought; ground radar biggest item.

By HENRY P. STEIER

Greater complexity and cost, and increasing application and availability were given as major factors in the Air Force's increased communications-electronics fund requirement for fiscal year 1957 during the House Appropriation Subcommittee hearings.

The overall program calls for $924.4 million. This is an increase of $174 million over 1956. The requirement included $827.2 million for communications-electronics equipment. This is an increase of $158.9 million over 1956.

In addition, $31.5 million would be required for installation-engineering and installation of fixed communications-electronics components previously procured, and $65.7 million for leasing of commercial communications services.

• **Maj. Gen. Gordon A. Blake,** director of communications-electronics USAF, told the Appropriations Committee high-speed, high-altitude weapons require defensive equipment capable of extremely rapid reactions and high traffic-handling capacity.

Since these capabilities are getting to be beyond human capacity, he said, we are placing greater reliance on electronic equipment, and will do so even more in the future. Potential enemies, he added, have developed their own defensive electronics capabilities to a high degree.

Biggest item was $355.6 million for ground radar equipment. This was identified in part as being applicable to IFF-SIF (Identification Friend or Foe-Selective Identification Feature) transponder equipment, the SAGE system, and the DEW-line system.

Electronic countermeasure equipment, next largest requirement, calls for $195.5 million. It includes airborne jamming equipment, "ground passive detection equipment" and distributed area jamming systems. Blake told the Committee that although the "universal jamming system" adopted in 1955 reduced the numbers of equipments to accomplish a jamming mission, improved enemy electronics capabilities have necessitated a net increase in the number of equipments required.

• **Third largest program requirement** was $150.9 million for airborne radio equipment excluding radar. This is a three-fold increase over 1956. Major purpose of this project requirement is retrofit of aircraft with equipment not installed during aircraft production. A major item in the AF program for modernization of in-service aircraft is short-range navigation including ground and airborne Tacan equipment.

In response to questioning from Rep. Glenn L. Davis (R-Wis.), on the performance of Tacan and where it is operating, Blake mentioned the Alaska installations and those at Atlantic City, N. J. and Rome Air Development Center, N. Y. Questions on performance of system have been well cleared up, Blake affirmed.

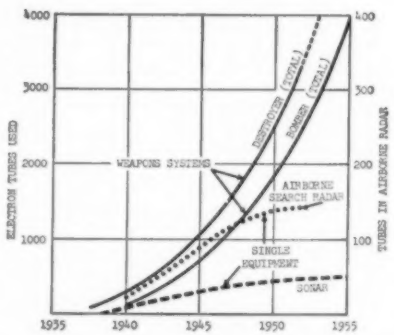
Air Force Program Requirements for Communications & Electronics

(Comparison of Fiscal 1956 and 1957)

	1956 estimate	1957 estimate
Airborne radio equipment	$49,048,000	$150,903,000
Airborne radar equipment	33,415,000	35,683,000
Wire communications equipment	15,923,000	15,138,000
Ground radio equipment	84,495,000	69,278,000
Ground radar equipment	311,292,570	355,580,000
Communications security equipment	2,923,000	5,062,000
Electronic countermeasure equipment	171,201,000	195,526,000
Installation of fixed communications-electronics technical components	27,561,467	31,513,000
Commercial communications systems	54,429,293	65,692,000
Total fiscal year program	$750,288,330	$924,375,000

Comparable Fiscal Year 1957 Budget for Procurement and Installation of Communications and Electronics Equipment and Leased Commercial Communications Services for AF, Army, and Navy.

	Million
Air Force	$924.4
Army	$110.2
Navy	$211.1



Graph shows increasing complexity of military electronics equipment as measured by increase in numbers of tubes used in typical weapons systems and individual equipments. Data was presented by Chester I. Soucy, Royal Canadian Air Force, at 1956 Electronic Components Symposium in Washington.

Among the other equipment to be installed is the airborne portion of the data-link equipment which provides "automatic control of interceptor aircraft from ground computors."

Part of the total $65.7 million for commercial communications systems would be for SAGE. The total is an increase of $11.3 million over 1956, and of this SAGE constitutes 60 percent of the increase.

The "installation of fixed components" program in the amount of $31.5 million includes improvements in BADGE (base air defense ground environment) for overseas air defense.

• **Rep. George H. Mahon** (D-Tex.) queried Blake on whether he had observed that electronics companies "have mushroomed over the country pretty well and have made large profits; that they have started off on a shoestring."

Blake said his "general impression was that a large part of the expansion had been provided by the growth of other companies who were substantial in the field 10 or 15 years ago." He gave Ramo-Wooldridge Corp. as a "good" example of one which "started out as a part of the Hughes Aircraft Co. and stems from a breakout of some of the people who work for that company."

Col. Robert Barrow, Chief, Electronics Branch, Equipment Division, Directorate of Procurement and Pro-

duction, USAF, gave the Committee a list of 49 companies with which the AF has placed the major portion of its procurements for communications and electronics. Of these companies, 10 were said to be producing between 60 and 70 percent by dollar value of total communications and electronics equipment, parts and supplies.

Asked if it would be possible to reduce complexity of electronics equipment and thus reduce the need for skilled maintenance personnel, Blake said such an aim is "one of our important objectives." However, he added, "If you increase your reliability so that nothing ever fails, of course, you would completely eliminate the need for maintenance. That is a Utopian objective, and one we obviously will never reach. General LeMay wants to fly higher and go farther and bomb more accurately every year. Complexity keeps pace with performance, and we trail along desperately trying to increase reliability and reduce complexity." ◈◈◈

Why Electronics Must Learn to Cope with Nuclear Propulsion

Air Force, testing effects of radiation on components at Oak Ridge National Laboratory, discovers many problems.

"Electronics people are going to have to keep up with nucleonics or be lost."

That was the word engineers got from Wright Air Development Center engineer Charles C. Robinson at the 1956 Electronic Components Symposium in Washington, D.C. this month.

With this forewarning, they were also advised to "cast a wary eye" on electronic equipment that will be used in nuclear fields. Robinson urged engineers to learn about and form concepts as to the meaning of nuclear terminology and the effect of the different energies on electronic components used near nuclear reactors.

Reviewing these effects as they are known today, Robinson pointed out that reactor engineering and control design could not go on without electronics engineers.

Anticipating the development of nuclear-powered aircraft, the Air Force originally directed its efforts to studies of effects on whole systems. This was done to rapidly point out component problem areas and to give participating personnel a "feel" for the work.

Various Systems Tested

Representative systems covering navigation, communication and radar devices were subjected to tests. This work was done some time ago, and was hampered because of the size of the systems and scarcity of radiation facilities to handle them.

• **The site finally selected** was Oak Ridge (Tenn.) National Laboratory, where the popularly known "swimming pool" was available. This is a pool of water measuring 40 x 20 feet and 20 feet deep. Suspended from a movable bridge over the pool is the reactor located 16 feet under water used for shielding radiations.

The Air Force put its systems in a waterproof tank which was then brought near the reactor.

Robinson said that just as the AF has accepted a nuclear radiation environment as another environmental factor, so should components engineers accept it as they accepted altitude, humidity, temperature, vibration and g-forces problems. However, a new brand of thinking is demanded for component application in the nuclear fields.

• **Things happen** in a different way when components are subjected to nuclear bombardment. Often, in thinking of damage to an object or material from ordinary forces, it is assumed the amount of damage is proportional to the amount of damaging element. In typical cases twice as much damaging element would do twice as much damage. This is not always the case with radiation.

For example, wire insulation was tested for insulation resistance change. Two samples were subjected to the same integrated dosage, known as NVT. This is the same *total* amount of energy. One sample however was "dosed" at a lower intensity, or "flux," for twice as long.

The accumulative effect of these dosages showed the sample subjected to

GLOSSARY OF NUCLEAR TERMS

The meaning of technical terms in the nuclear energy field will be of growing importance to electronics engineers as they encounter new problems and test conditions with electronics designs associated with the nuclear reactor propulsion field.

The short glossary listed here can be used as a memory refresher. It is not an encyclopaedia, but a few terms that will be encountered in handling problems dealing with radiation of electronics equipment:

- Alpha Rays—The barrage of alpha particles continually issuing from some radioactive substances. The particles are positively charged matter made up of two protons and two neutrons. This structure is the same as in the helium atom.
- Beta Rays—The barrage of beta particles continually issuing from some radioactive substances. Beta particles are electrons emitted with great force from the nucleus of some radioactive substances.
- BEV—A thousand million (American billion) electron volts.
- Barn—A unit of cross section measure used on an atomic scale of nuclei.
- Electron Volt—An extremely small unit of energy representing the energy acquired by a single electron to which a force of one volt is applied.
- Flux—Particles of matter per square centimeter per second.
- Gamma Ray—An ultra-short X-ray type of wave radiation which is emitted from the nucleus of some radioactive atoms.
- Half-life—The time it takes for a radioactive element to lose one-half its radioactivity.
- Isotopes—Atoms of the same element (occupying the same place in the Periodic Table) which have different atomic weights. In the singular it designates one form of an element which has atoms of different atomic weights.
- MEV—A million electron volts.
- Moderator—A material used for slowing down neutrons in an atomic reactor; usually graphite or heavy water.
- Neutron—A fundamental particle of matter which is neutral in character—it carries no electrical charge. A constituent of all atomic nuclei other than the common isotope of hydrogen, atomic weight 1.
- Nucleus—Solid core of an atom around which the orbital electrons circle, at relatively great distances. In the nucleus is the atomic energy of the atom, thus the term *nuclear energy.*
- NVT—Integrated flux.
- Proton—Fundamental positively charged particle of matter. The nucleus of the simplest atom: hydrogen, at atomic weight 1.
- Radiation—Streams of Electromagnetic waves or atomic particles.
- Slow Neutrons—See *thermal neutrons.*
- Thermal Neutrons—Neutrons slowed down by passage through a moderator until their energies are but a fraction of an electron volt.

A "Glossary of Terms in Nuclear Science and Technology" has been prepared in cooperation with the National Science Foundation and published by the American Society of Mechanical Engineers. It is available from that society at a cost of $5.00.

TRANS WORLD AIRLINES

UNITED AIR LINES

NATIONAL AIRLINES

AMERICAN AIRLINES

CONTINENTAL AIR LINES

PAN AMERICAN WORLD AIRWAYS

DELTA AIR LINES

PAN AMERICAN-GRACE AIRWAYS

EASTERN AIR LINES

KLM ROYAL DUTCH AIRLINES

BRANIFF INTERNATIONAL AIRWAYS

SABENA BELGIAN WORLD AIRLINES

AIR FRANCE

JAPAN AIR LINES

SWISSAIR

SCANDINAVIAN AIRLINES SYSTEM

PRATT & WHITNEY AIRCRAFT
DEPENDABLE ENGINES

PRATT & WHITNEY ENGINES HELP BUILD U.S. LEADERSHIP IN JET LINERS

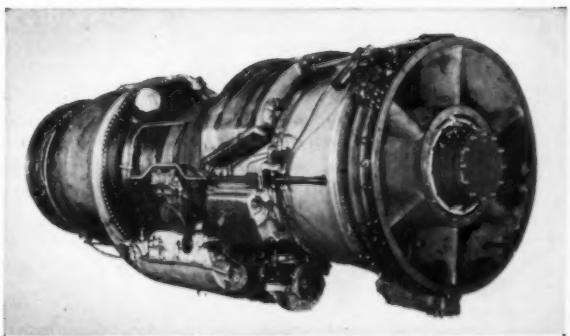
16 leading airlines will offer jet service in U.S. transports with JT3 and JT4 engines

American-made jet airliners flying for 16 U. S. and foreign lines will be in service over five continents starting in 1959. More than 190 Boeing 707s and Douglas DC-8s have been ordered to date—and still more orders are in prospect.

Turbojet engines designed, developed, and produced by Pratt & Whitney Aircraft will power both the Douglas DC-8s and the Boeing 707s. These are the JT3, commercial version of the powerful J-57, or the even more advanced JT4. Both are of twin-spool, axial flow design which provides high thrust coupled with outstanding fuel economy.

The new Douglas and Boeing jet transports will give the United States undisputed leadership in jet air travel. No aircraft in sight challenges them for speed, passenger capacity, and range.

Throughout the history of aviation, Pratt & Whitney Aircraft engines have led the field. Now the Pratt & Whitney turbojet engines join the distinguished company of the Wasp, the Twin Wasp, the Double Wasp, and the Wasp Major, helping the U. S. aviation industry continue its world leadership.



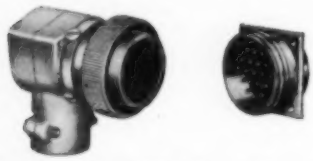
PRATT & WHITNEY AIRCRAFT JT3 ENGINE, civil aviation's version of the widely-used military J-57, most powerful jet engine now in quantity production.

PRATT & WHITNEY AIRCRAFT

Division of United Aircraft Corporation • Main Office and Plant: East Hartford, Connecticut
Branch Plants: North Haven—Southington—Meriden

K (STANDARD)

For Aircraft, Electronic, Instrument, Military, Missile, Industrial and Commercial Applications.

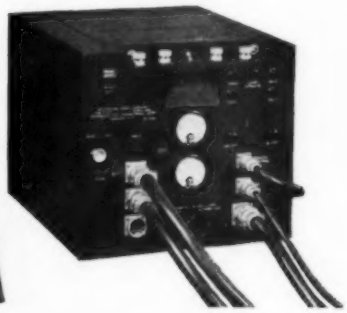


Standard K and RK...in straight and angle 90° plugs, wall mounting receptacles. Conduit and clamp entry types. 1 to 82 contacts in 213 different insert arrangements. 10-, 15-, 30-, 40-, 60-, 80-, 115-, and 200-amp. silver-plated brass contacts. High quality phenolic, melamine, and formica insulators. Cadmium-plated aluminum alloy shells. Flashover voltages: 1100 to 5000v 60cps ac rms.

connect with CANNON PLUGS

APPLICATION

Application of R and RK connectors on a recording oscillograph.



original aircraft, electronics, sound, and all-purpose line

KH, RKH
(HERMETICALLY SEALED)

For Use Under Critical Pressure and Leakage Conditions

Hermetically sealed connectors... with steel shells, steel contacts, and Can-seal glass insulators, fused to shell and contacts. *True hermetic sealing.* Electro tin plating over cadmium plate over copper flash provides highly receptive surface for soldering and corrosion resistance.

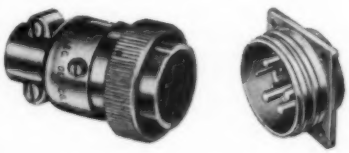
STEEL SHELL FIREWALL

For Open Flame Protection Against High Temperatures

FW and FWR Cannon K Firewall Connectors... available in straight and angle 90° plugs, wall mounting receptacles. Inserts of phenolic or fireproof inserts of glass-filled materials. Crimp type contacts. Cannon made the first firewall connector and continues the leader in this important field.

RECORDER CONNECTOR

For Telephone "Beeper" Connectors



SK-M7-21C...Widely used on two leading makes of telephone recorded connector units known as "beepers" because of the signal required by law in such recordings.

special acme thread • rugged construction • variety of coaxials • integral clamps

RK
PLUG AND RECEPTACLE

For Flush or Semi-Flush Mounting

RK plug and pin assemblies are equipped with an external threaded coupling nut which is the reverse of the standard K series. Note, RK will not mate with K's.

RLKL and LKL
(TV SWITCHING PANEL)

For TV Panel Switching

Quick Connect and Disconnect RLKL Plugs... designed for one-hand fast disconnect use on TV station program switching panels. Feature a quick coupling means. Latchlock secures plug to mated fitting (RLKL receptacle). Thumb pressure releases it.

K ACCESSORIES

Straight and Angle 90° Junction Shells, Dust Caps, Bonding Rings, Gland Nuts, Clamps, Dummy Receptacles

Featuring High Quality Materials and Workmanship... Junction shells are designed to protect, shield, and carry wires through walls, panels or bulkheads to conduit. Dummy receptacles hold and protect plugs when not in use.

cannon plugs • standard of quality for the industry

TBF-K

For Carrying Circuits Through Bulkheads

TBF-K Bulkhead Connectors... feature a double-faced construction *allowing mating at both ends.* Pin inserts. Single piece shell. Five insert assemblies available.

Other Cannon Series... Mil. Spec. "AN" (full line)—External Power Connectors—Switching Types—dc Solenoids—Guided Missile Launching Connectors—Miniatures and Sub-Miniatures.

See "K" Bulletin for Engineering Data.

Please Refer to this Magazine or to Dept. 404

CANNON ELECTRIC

CANNON PLUGS

CANNON ELECTRIC COMPANY, 3208 Humboldt Street, Los Angeles 31, California. Factories in Los Angeles; East Haven, Connecticut; Wakefield, Massachusetts; Toronto, Canada; London, England; Melbourne, Australia. Manufacturing licensees in Paris, France; Tokyo, Japan. Contact our representatives and distributors in all principal cities.

Circle No. 13 on Reader Service Card.

lower flux for a longer time had twice the remaining resistance as the other sample.

Stray voltages as high as 250 volts were generated in insulated wires under bombardment. Sometimes impedance measured outside-in was not the same as that measured inside-out on shielded conductors. This was caused by rectification of the applied voltage. Rectification effects seem to hinge upon wire geometry. For example RG-58/U and RG-62/U shielded cable produced voltages of opposite polarity and rectifications were reversed.

• **Another important effect** is voltage breakdown. Sometimes it is reduced as much as five times, and once breakdown occurs there is no recovery of resistance.

These insulation experiments and others on semi-conductor devices are being pursued in an active AF program being carried out at the Graphite facility at Oak Ridge National Laboratory. Goals in the work are determination of what are called "threshold of damage" and "tolerance levels."

"Threshold of damage" refers to an integrated quantity of radiation, or NVT. Its value will indicate the NVT that appreciably affects operation of a component.

"Tolerance level" is the intensity of radiation to which components can be exposed for extended periods of time before operating characteristics are significantly affected.

Robinson revealed that "no semiconductor will approach the resistance of vacuum tubes to radiation." To take advantage of size and power factors through use of transistors and other semi-conductors, much work remains to be done to find such devices that are resistant to radiation.

• **A bright spot** in the semi-conductor picture is the discovery that 80 per cent of the observable damage done to a surface barrier transistor took place in the first part of a two-minute irradiation. During the next five two-minute periods there was little change. Further checks are needed to substantiate results.

Among semi-conductor devices, junction diodes and transistors are more resistant than point-contact types. Silicon offers more resistance than germanium.

In diodes the barrier is broken down until the device becomes an "ohmic" conductor. Another problem was discovered in the annealing of germanium.

Annealing in Metals

Work on irradiated metals has shown that annealing takes place. This has been caused by thermal agitation, even at room temperatures. This same type of annealing that took place in tests on germanium metal did not occur in germanium rectifier components.

Robinson said one approach to the problem of testing would be to check effects on all materials used in components. However, a list of such materials would look like the Periodic Table of the Elements. Such a program would, he said, "take ages." Attention has been focused on immediate problems and so the approach is from the electronic viewpoint, with components operating as such.

Asked when the new "breed" of evaluated components will be needed, Robinson answered, "Next year." Admittedly, the whole job of finding answers to radiation effects is in the very earliest stages, and more complications will arise as work progresses.

• **New problems** are on the horizon. Now, one components study contract has been awarded by the AF. This is with Admiral Corp. and covers studies of the effects on "typical components" to determine threshold of damage and tolerance level factors. The work is being coordinated with the Argonne National Laboratory which supplies radioactive materials to Admiral.

Among the host of new problems and considerations is activation of parts of electronics gear that are subjected to neutron bombardment. Since maintenance men must repair or replace equipment in airborne or other electronics installations near a reactor, the "half-life" values of every metal used must be considered.

Half-life is the time it takes for a radio-active isotope to lose one-half its radioactivity. Time can range from millionths of a second to hundreds of years. Radium has a half-life of 1,540 years. Silver, aluminum, cadmium, magnesium, tin and titanium are some metals with short half-life isotopes. Zinc, tantalum, cobalt and iron isotopes have long half-life.

The half-life times of metals used in electronics equipment can make a big difference in future aircraft maintenance work. Half-life will decide between the relative "ease" of repairing and handling equipment with long-handled tools, or the handicap of remote control of tools from behind two-feet-thick concrete walls. ◈◈◈

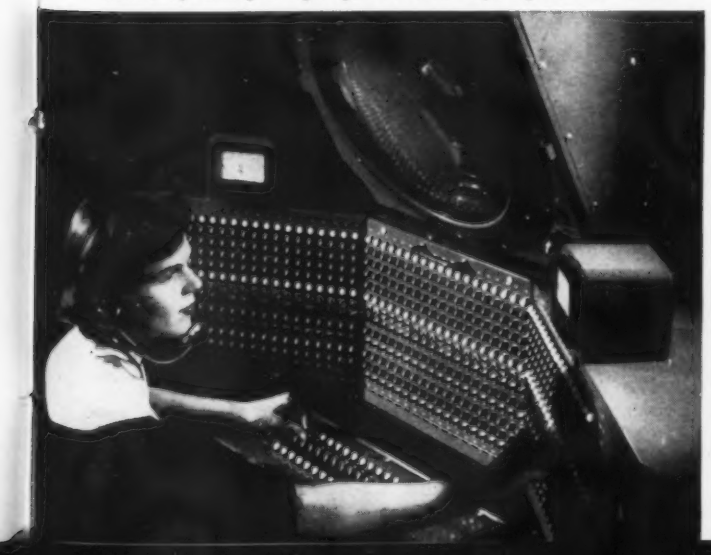
Air Force to Give Volscan ATC System A Workout

Air traffic management in the airport approach phase will get a fast-"thinking" robot helper this summer when the first production Volscan system is flight-tested by the U.S. Air Force. A system linking existing GCA radars and instrument landing systems, Volscan was designed at the AF Cambridge Research Center to bring home jet aircraft at high rates up to 120 per hour.

"Blips" picked up from planes 40 to 60 miles distant appear on the monitor console display shown at (top) left. The controller, by aiming a light gun at each blip, signals the Volscan analog computer to go to work on calculating a "cube of space" for each aircraft.

After that Volscan follows the planes and provides instructions on heading and altitude until the "entry gate" is reached. The electronic manager assigns cubes so that an orderly procession into the gate is achieved.

The approach instructions are sent to 14 relay units, one for each plane. At the units operators communicate information by radio to each plane. Seven of the relay units are shown at the right.



People

MANUFACTURING

Herbert O. Patchel, Jr., named vice president and gen. mgr. of The Babb Co., with headquarters in Phoenix, Ariz.

Albert L. Varrieur, gen. mgr. of Denver division, named v.p. of the Martin Co.; **Don P. Herron** made supervisor of information services for Denver division.

Patchel

Varrieur

Air Vice Marshal Frank Wait (ret.) appointed asst. to the president of Fleet Manufacturing Ltd. and Doman-Fleet Helicopters Ltd.

W. Waits Smith and **Frank W. Godsey, Jr.,** elected vice presidents of Westinghouse Electric Corp.

Fred L. Roscoe named domestic sales mgr. for Cessna Aircraft Co.

Hermann T. Poeschl appointed manager of Lear, Inc.'s German operating company in Munich.

Charles E. Myers named sr. engineering test pilot on the Convair XFY-1, replacing **"Skeets" Coleman,** who left company to join Fairchild Aircraft.

Dr. Wendell B. Sell appointed gen. mgr. electronics division of American Machine & Foundry Co.

Bernard C. Servais named gen. mgr. of the Air Corporation of Miami.

Warren D. Orr promoted to military relations dept. mgr. at Lockheed's missile systems division; **John H. Carter** appointed associate research director; **Dr. Calvin H. Wilcox,** associate research scientist; **Dr. Robert W. Bagley, Dr. Edison Greer, Dr. Mendel Sachs, Dr. Clarence F. Kool** and **Dr. Alexander Dessler** all added to the staff of research laboratory.

George Eugene Pelletier appointed dir. of public relations for the Aerojet-General Corp.

Rear Adm. Frederick R. Furth (USN, ret.) elected a v.p. of Farnsworth Electronics Co. division of I.T.&T. Corp.

Alexander MacGillivray appointed v.p.-finance of Hughes Aircraft Co.

Edward J. Horkey, resigned as v.p.-engineering of Pastushin Aviation Corp. to form his own firm, Horkey Associates, in Los Angeles.

J. Murray Wilson elected sr. v.p. and dir., **Donald H. Putnam** elected a director, and **Aldrich P. Balacek** a v.p. of G. M. Giannini & Co.

Shepard Dudley elected a v.p. of Esso Export Corp.

H. L. Thackwell, Jr., made asst. president of the Grand Central Rocket Co. of Redlands, Calif.

Ernest W. Marchand appointed director of mfg. of Greer Hydraulics, Inc.

Charles B. Carroll, project engineer on the Convair XFY-1 vertical takeoff fighter, retired.

Herman Pusin promoted to chief engineer of engineering division, Martin Co.

G. Roger Smith appointed product manager of Harvey Aluminum.

AIRLINE

Robert J. Smith named president, gen. mgr. and a director of Slick Airways.

Samuel L. Higginbottom named mgr. of engineering at Trans World Airlines' overhaul base, Kansas City, Kas.; **Gordon W. Ray** promoted to dir. of sales administration for TWA; **John A. Collings** continues as chief executive officer pending election of a president.

J. C. Roberts named director of airports and facilities for Braniff International Airways.

Mohawk Airlines announced the following changes: **Thomas J. Kirkup,** from gen. traffic and sales mgr. to v.p.-sales; **John R. Carver,** v.p. and secy., elected to board of directors.

Kirkup

William M. Ehart returns to National Airlines as dir. of public relations and adv., replacing **Ray Smith** who resigned to open his own public relations firm in Miami.

Dennis A. Longren made Orient Region treasurer for Northwest Airlines.

GOVERNMENT

Theodore Hardeen, Jr., Administrator of the Defense Transportation Administration, succeeds, **Frederick B. Lee** as chairman of the Interdepartmental Aviation Manpower Committee.

HONORS

S. J. Solomon, president of California Eastern Aviation, Inc., elected president of Aeronautical Training Society.

Solomon

George Nichols of Northrop Aircraft, Inc., awarded recognition for pioneering contributions to aero-medical research in the designing and construction of high-speed sleds by the aero-medical laboratory of Holloman Air Development Center.

Gerald J. Godbout, cargo supt. for Capital Airlines, elected president of the Air Cargo Association of Washington.

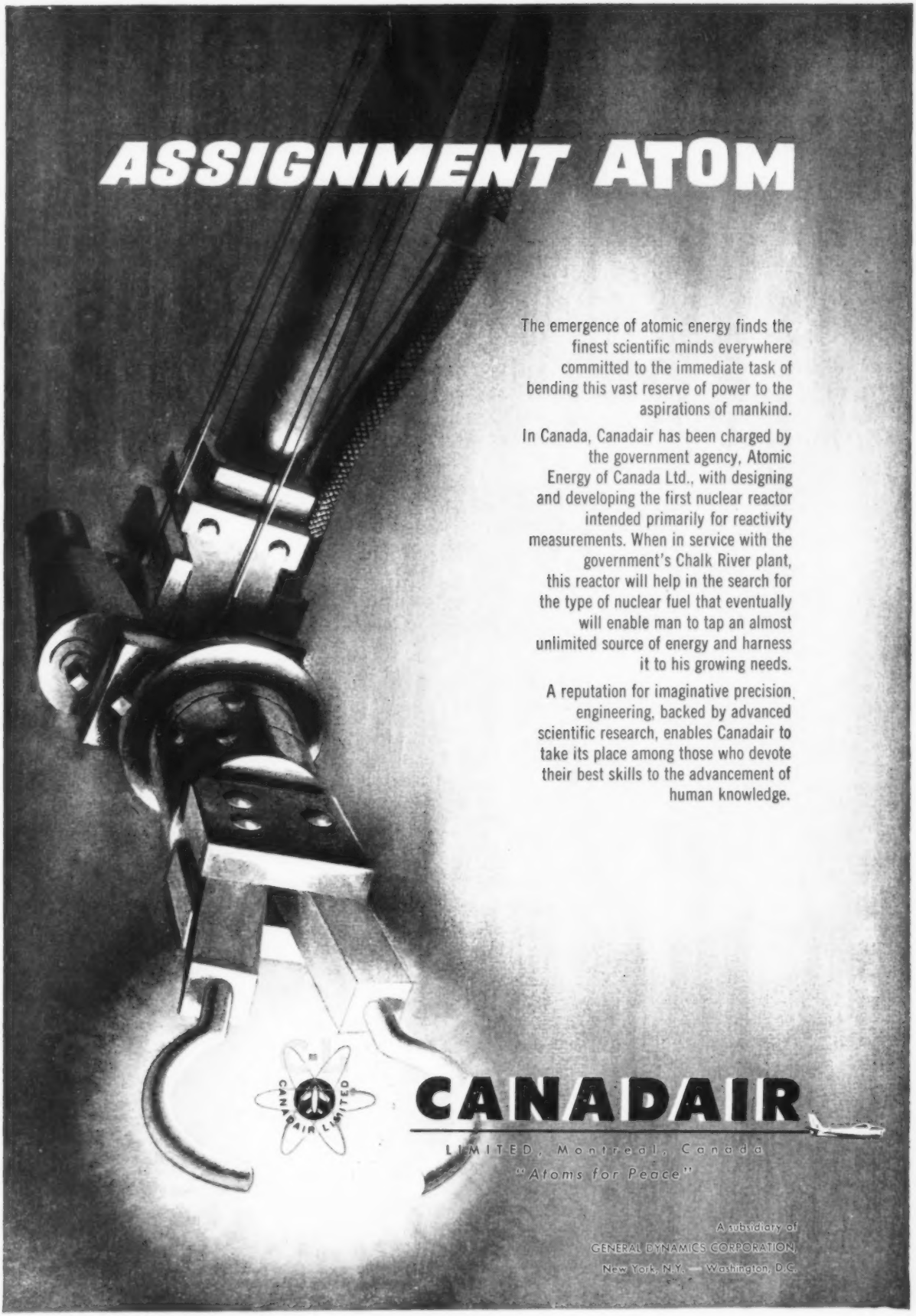
Five new members were elected to the Board of Goverors of the Flight Safety Foundation, Inc.: **Oakleigh L. Thorne,** president, The Corporation Trust Co.—C. T. Corporation System; **T. F. Walkowicz** of the staff of Laurance S. Rockefeller; **Fred M. Glass,** sr. v.p. of Empire State Bldg. Corp., **Brig. Gen. Harold R. Harris** (USAF, ret.), Aviation Financial Services, Inc.; **Grover Loening,** aeronautical engineering consultant.

Robert J. Shafer of Eastern Air Lines and **John B. Young** of TWA received the Air Transport Assn.'s 1955 Edgar S. Gorrell Awards for outstanding contributions toward improvement of weather analysis, weather forecasting, or the dispatching of aircraft.

The Air Force's Exceptional Service Award went to **Roger M. Kyes,** former Deputy Secretary of Defense, for outstanding contributions to the build-up of the nation's airpower.

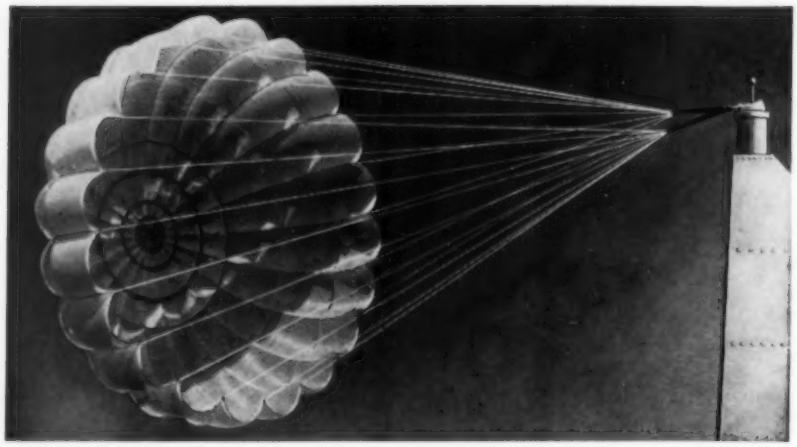
New Helicopter Society President

Charles M. Seibel, left, chief engineer of Cessna's helicopter department, is new president of American Helicopter Society, succeeding Army's Col. William B. Bunker, center. Rear Adm. Lawrence B. Richardson, USN (ret.), vp of General Dynamics Corp., right, was principal speaker at the Honors Night Dinner held in connection with AHS' 12th annual forum.


ASSIGNMENT ATOM
The emergence of atomic energy finds the finest scientific minds everywhere committed to the immediate task of bending this vast reserve of power to the aspirations of mankind.
In Canada, Canadair has been charged by the government agency, Atomic Energy of Canada Ltd., with designing and developing the first nuclear reactor intended primarily for reactivity measurements. When in service with the government's Chalk River plant, this reactor will help in the search for the type of nuclear fuel that eventually will enable man to tap an almost unlimited source of energy and harness it to his growing needs.
A reputation for imaginative precision engineering, backed by advanced scientific research, enables Canadair to take its place among those who devote their best skills to the advancement of human knowledge.
CANADAIR LIMITED
CANADAIR
LIMITED, Montreal, Canada
"Atoms for Peace"
A subsidiary of
GENERAL DYNAMICS CORPORATION
New York, N.Y. — Washington, D.C.

New Products and Processes

RADIOPLANE'S 'SUPERSONIC' PARACHUTE



Radioplane Co., a subsidiary of Northrop Aircraft, Inc. is developing a new parachute aimed at improving the prospects of crew survival in high-speed bailouts.

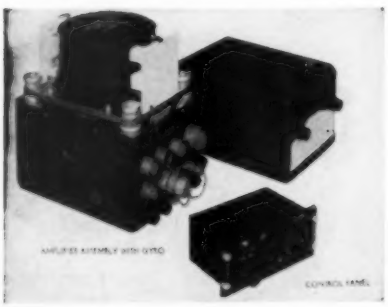
Called Skysail, it is designed for use at higher speeds and altitudes than feasible with existing parachutes. Goal is to permit bailouts at ultimate altitudes of present-day aircraft and at transonic speeds. Its canopy is designed to produce a high degree of stability and thereby reduce injuries on landing.

Skysail is being developed in conjunction with the Navy's El Centro, Calif., parachute test facility. It is essentially a canopy of concentric cloth rings assembled from specially-shaped panels.

The 'chute pack includes design protection against opening by air blast in a bailout at speeds greater than 450 mph. A new type of harness uses wider webbing bands at high-stress points where most of the opening forces are transmitted to the jumper.

Circle No. 161 on Reader Service Card.

COMPASS SYSTEM



Lear, Inc. has developed a new type aircraft compass system, marking its entry into the military aircraft gyro-navigational field.

The system was developed for the Navy's Bureau of Aeronautics and has been designated Type MA-1. It is a highly accurate, all-purpose, gyro-slaved directional system designed for use under all operating conditions, including high altitudes, where ordinary compasses become unreliable.

First production units are earmarked for installation on the Grumman F11F-1, the Grumman UF-1 amphibian and the Lockheed R7V-1 transport.

The system has a random drift rate of less than 4° per hour. It has a tubeless amplifier using silicon transistors and magnetic amplifiers. It weighs only 16.7 lbs.

Circle No. 156 on Reader Service Card.

OIL FILTER

An oil filter designed for most aircraft engines by **Airwork Corp.** is said to remove an average of 2½ lbs. of solids from lubricating oil in 100 hours of normal operation.

The filter weighs 10 lbs. installed. A patented feature prevents stoppage of the oil line, even when the filter cartridge is completely clogged.

Airwork has also developed a new air filter-oil filter combination for maximum protection of crop-dusters. Literature is available on both new items.

Circle No. 163 on Reader Service Card.

FREE GYRO

American Gyro Corp., div. of Daystrom Pacific Corp., has developed a free gyro small enough to meet space requirements for missile applications and capable of delivering full efficiency in both missile systems and piloted aircraft systems.

Model F10A-1 is 6.25 in. long, has a diameter of 3.297 in. and weighs 4.5 lbs. It is one of a family of 35 caging and torque gyros built by American Gyro.

A unique feature is the ac pick-off adjustment that can be made on the exterior of the gyro case, leaving the hermetic seal unbroken.

Circle No. 164 on Reader Service Card.

RADIOGRAPHY UNIT

An X-ray unit designed specifically for rapid inspection of aircraft structures has been developed by the Research & Control Instruments Division, **North American Philips Co.**

Designated the Norelco MG 260H, the unit has its X-ray tube and high-tension generator completely enclosed in one package, weighing 230 lbs. Maximum high voltage output is 260,000 volts, minimum 100,000.

The unit has a focus of 1.5mm, providing excellent radiographic detail, the manufacturer says. It is oil-insulated, air-cooled and designed for a load of 4 milliamperes.

Circle No. 162 on Reader Service Card.

RADAR TEST SET

A pre-flight test set that simplifies airborne radar ground maintenance has been developed by the Narda Corp.

With this set, accurate testing of the performance of airborne weather radar in less than a minute is possible. It operates from the 400-cycle power available in the aircraft.

The Narda test set is used in conjunction with a Narda 833 echo box which provides an artificial target for the radar. The pre-flight test set, connected to the radar video output, measures accurately the response of the radar to the target. Radar performance is read directly from the front panel of the set.

Circle No. 167 on Reader Service Card.

PORTABLE AIRCRAFT HEATER

A portable aircraft heater for preheating simultaneously engines, battery compartments and pilot cabins of two- or four-engine planes has been developed by **Les Bowman Engineering Co.** for Slick Airways, Inc.

THE DEHAVILLAND U1-A OTTER

In Service with the United States Army

The Otter can carry 10 passengers or 1 ton of cargo for 500 miles range.
It is at home wherever 1000 feet of landing strip is available.

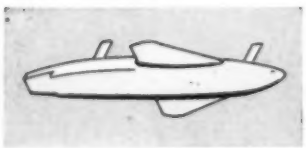
Designed and built by

THE DE HAVILLAND AIRCRAFT OF CANADA, LIMITED

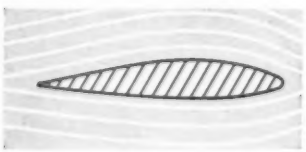
Postal Station "L", Toronto, Ontario

4-56R

Even the hot desert sands offer no landing problems to aircraft whose design includes the Pantobase landing system. A product of Stroukoff research and development, Pantobase will permit landings and take-offs from snow, ice, sand, water and unimproved terrain; thereby extending the operational capabilities of the aircraft and reducing the need for conventional airports in many remote and previously inaccessible parts of the earth's surface.



Pantobase—When designed into an aircraft the Pantobase system enables the plane to land and take-off from many types of surface without changes or additional landing equipment.



BLC-Boundary layer control as developed by Stroukoff increases the effective lift and delays stalling of the wing, thereby reducing required speeds and distances for take-offs and landings.

Achievement is a tradition at Stroukoff. A leader in the development and design of cargo and transport aircraft, Stroukoff offers challenging opportunities to creative engineers.

Extending the Frontiers STROUKOFF AVITRUC *of Aircraft Performance*

Stroukoff

WEST TRENTON, NEW JERSEY

Circle No. 17 on Reader Service Card.

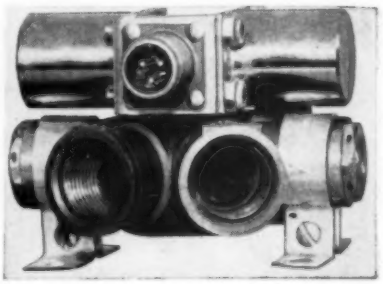
NEW PRODUCTS

The heater can also be used to heat portable hangars and large tents or shelters, to defrost plane wings or apply heat under wing covers. It has retractable handles and removable wheels, permitting easy conversion from a wheel-mounted to a sled-mounted unit without removing the wheels.

Rated at 250,000 BTU per hour, the heater is powered by a Kohler K-90 engine manufactured by the Kohler Co. The engine, a 4-cycle, air-cooled unit that develops 3.6 hp at 3,600 rpm, is mounted on the rear of the heater's housing. Overall the heater measures 42″ x 26″ x 56″.

Circle No. 160 on Reader Service Card.

HI-TEMP MINIATURE VALVE



A new line of high-temperature miniature valves has been developed by **Adel Precision Products, Inc.**

These valves are said to embody all the advantages of previous designs, incorporate a number of innovations and require up to 50% less space and weight than most high-temperature valves. Complete information and specifications are available on request.

Circle No. 155 on Reader Service Card.

THREE-WAY CLAMP

Northrop Aircraft, Inc. has developed a new type of "breakaway" clamp for use as a fuel-line coupling and other applications on the USAF Northrop Scorpion F89D, which carries 101 rockets in wingtip pods. The three-way clamp has many other industrial applications. **Awica Products, Inc.** has

Step back into the 11th Century in Peru's mysterious Machu Picchu. Hidden for 350 years, its palaces are still intact

Hook a 15-lb. rainbow trout in Chile's lakes. In Buenos Aires, sink your teeth into tender, juicy steak, cost under $1

Shop for silver in Peru, copper in Chile, alligator bags in "B.A." Dollars go a long, long way in countries Panagra flies to

There's something exciting for everyone in sunny South America

And your Travel Agent now offers new low-cost tours —to fit your time, taste and purse.

• New low fares and low living costs in the countries on Panagra's routes make a happy combination. A 28-day skycruise around South America from New York costs only $923.40 for each of two traveling together.

Included in this tour are air fares, hotel rooms, guided sight-seeing trips in every city... and you visit every major city on both coasts of South America, flying with Pan American and Panagra.

For a shorter vacation, 11-day holiday to Panama, Quito and Lima: $515.80 from Miami, $586.22 from Chicago, $615.20 from Los Angeles for each of two traveling together.

Call your Travel Agent or PAA, U.S. Sales Agent for Panagra.

You'll marvel at the Argentine-Chilean lake district. Uncrowded, hospitable, inexpensive—tourists call South America *"the friendliest continent of them all"*

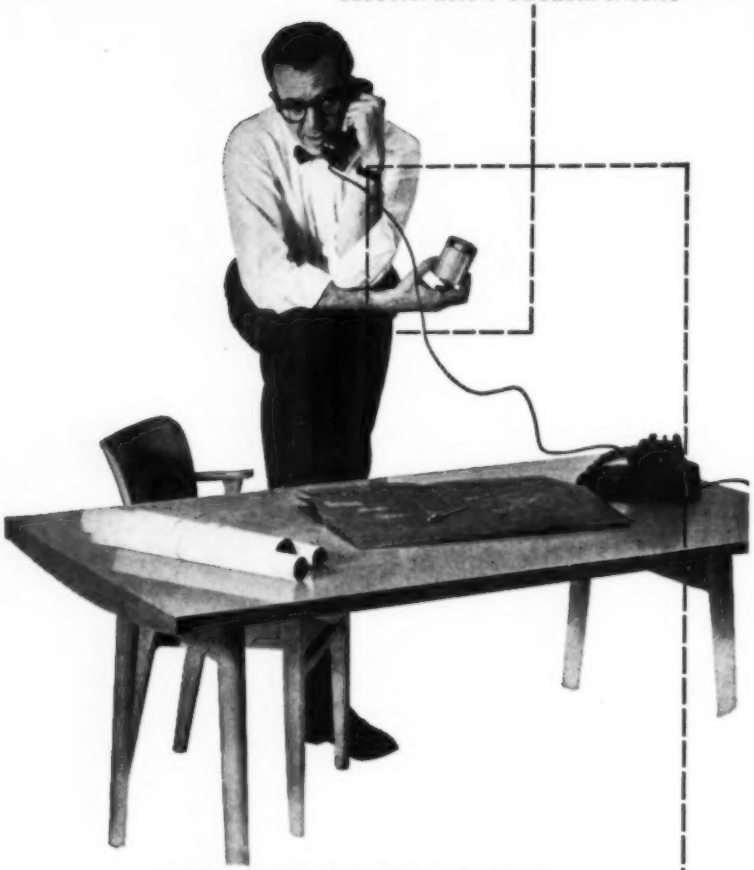
Daily DC-7Bs equipped with radar, and DC-6Bs from N.Y. over National's route to Miami, PAA's to Panama, Panagra's to "B.A."

WORLD'S FRIENDLIEST AIRLINE

PANAGRA

PAN AMERICAN-GRACE AIRWAYS

To Extend the Frontier of Your Acceleration Measurement



RUGGED LINEAR ACCELEROMETER MAINTAINS ±2% ACCURACY DESPITE EXTREME SHOCK AND VIBRATION

Capable of measuring from 0 to 4 G's in one degree of freedom with better than ±2% accuracy—Norden-Ketay's linear accelerometer is engineered for high reliability under extreme shock and vibration. Designed primarily for use in such military applications as fire control, navigation and guidance systems, it provides:

EXCELLENT VIBRATION COMPENSATION—maintains accuracy under vibrations from 0 to 500 CPS.

HIGH SHOCK RESISTANCE — performs dependably even after 30 G's shock.

COMPACT DESIGN — occupies only 9 cubic inches (2⅛" diameter, 2½" length).

LIGHTWEIGHT CONSTRUCTION — complete unit weighs less than 1 lb.

We welcome the opportunity to adapt, modify and redesign our accelerometers to meet your particular application. For complete information write for data file #025D.

NORDEN-KETAY CORPORATION

INSTRUMENT AND SYSTEMS DIVISION
Wiley Street, Milford, Connecticut

INDICATING PRECISION PRESSURE GAGES • REMOTE INDICATING DEVICES • ANALOG DIGITAL CONVERTERS
FORCE BALANCE PRESSURE TRANSDUCERS • ELECTROMECHANICAL CONTROL SYSTEMS • AIRBORNE RADAR
SHIPBOARD LINE CONTROL EQUIPMENT • AIRCRAFT FUEL FLOW INSTRUMENTATION • ACCELEROMETERS

Circle No. 18 on Reader Service Card.

NEW PRODUCTS

been licensed to manufacture it.

Named the Tri-Lok, the clamp is made of three interlocking segments and tightened by use of an integral toggle screw. A turn of the screw allows the clamp to separate into three parts for quick disconnect of fuel lines.

Unlike most single-action clamps, the Tri-Lok exerts an even pressure at all points of any tubular surface to which it is applied.

The clamp was designed by Joseph Klompar, Northrop designer-engineer.

Circle No. 157 on Reader Service Card.

HYDRAULIC TUBE FITTING

A new type flareless hydraulic tube fitting developed by the **Weatherhead Co., Fort Wayne Div.,** designated the 7,000 Series Ermeto, meets new standards set by the Society of Automotive Engineers.

Designed specifically for high-pressure pneumatic and hydraulic systems, the fitting is said to have the following advantages: it will accommodate minimum close coupling and facilitates assembly; its new phosphate finish is resistant to nonflammable hydraulic fluids as well as petroleum base fluids, and it is designed for use with the new SAE "O-ring," withstanding higher operating pressures without the use of backup rings.

The 7,000 Series is stocked in 31 styles and in sizes from ⅛" to 2".

Circle No. 158 on Reader Service Card.

STATISTICAL ACCELEROMETER

A statistical accelerometer developed by **Maxson Instruments Div., the W. L. Maxson Corp.,** is a simple, convenient means for counting the number of times pre-selected "g" levels are equalled or exceeded.

Originally developed for recording accelerations experienced in maneuvering military aircraft or missiles, the instrument is useful wherever it is desirable to know what shocks have been encountered, as in shipping delicate apparatus.

The instrument consists of a group of acceleration-sensitive switches, built

The part played by aircraft accessory equipment is all important. For operators of turboprop aircraft, it is essential that the propellers combine the longest overhaul life with the lowest overhaul cost. To achieve this, the development of the propeller must have proceeded in step with the gas turbine engine. Rotol propellers were the first turbine-driven aircraft propellers in the world to fly (September 1945) and since that time their development has been continuous.

Accessories, operated by engine-driven gear-boxes or air turbine motors, are also an essential requirement in modern aviation. A further operational requirement is simple and lightweight equipment for the exact synchronising of turboprop or turbojet engines, or for the accurate proportioning of fuel. Such equipment, which now forms an integral part in the systems of many military and civil transport aircraft, is representative of the research, design, development and production at . . . . . .

ROTOL *Limited*

An Associate Company of ROLLS ROYCE LTD., and THE BRISTOL AEROPLANE COMPANY LTD.

ROTOL LTD · GLOUCESTER . ENGLAND

U. S. A. Representative: Vernon Crudge, Room 1501, 630 Fifth Avenue, New York 20, N. Y.

Circle No. 19 on Reader Service Card.

NOW...
27
CHANNELS
narco
simplexer
VHF RECEIVER and TRANSMITTER

All the frequencies you want for any tower or center communications can be accommodated in the new 27 channel Narco Simplexer. This top-quality communications unit embodies a wide-band transmitter—actually six separate transmitting circuits — for uniformly strong transmission plus the famed Narco "whistle-stop" tuning feature which lets you tune the VHF receiver precisely to the frequency desired.

The Simplexer accommodates all 24 frequencies used between 118.1 mc and 122.8 *plus* 126.7 mc, *plus* two additional crystals for special purposes.

No other communications unit available has the quality, the proven stamina and reliability plus compactness for anywhere near the price. Your communications problems will be solved with the new VC-27 Simplexer. See it at your Narco dealer's or write for new brochure.

Omniplexer Adds OMNI for only $195

Here's the answer for a low-cost, accurate Omni—the Narco Omniplexer which can be plugged into any Narco Simplexer. Only 3" high and 6¼" wide, it has vernier tuning for precise course setting. Ideal as a basic navigation system or the low-cost answer for dual omni.

narco
NATIONAL AERONAUTICAL CORP.
Ambler, Pennsylvania

Circle No. 20 on Reader Service Card.

NEW PRODUCTS

to make contact at predetermined levels and directions of acceleration, and a set of four-digit electromagnetic counters connected to the switches so that each counter tallies the number of times its associated switch operates. It measures 7¼" x 2¾" x 2¾" and weighs 40 oz.

Circle No. 159 on Reader Service Card.

VIBRATION CALIBRATOR

ACF Electronics, division ACF Industries, Inc., has announced a new instrument to calibrate vibration pick-ups or measure vibration. The Model 501 uses self-calibration with reference to a precise standard displacement.

The calibrator measures over four decade scale ranges from 20 microinches to 0.02 inch full-scale. Readings are independent of frequency from 10 to 10,000 cps. Accuracy is rated at better than 5 percent full-scale. The unit works on the principle of mutual inductance variations through differences in spacing between the probe and vibrating surface.

Circle No. 150 on Reader Service Card.

GERMANIUM POWER DIODES

Three germanium power diodes, Types 1N91, 1N92, and 1N93, have been added to the semi-conductor line of **Clevite Transistor Products,** division of **Clevite Corp.**

According to the manufacturer the new diodes feature: four times the rectified power in the same space as other devices; high efficiency that gives very low forward resistance with high back resistance; the long life characteristic of germanium.

Specifications include: peak inverse voltages up to 300 volts; peak forward currents to hundreds of milliamperes; full load voltage drops of approximately 0.5 volts; operating frequency of 50 kc; storage temperature of 85° C.

Circle No. 165 on Reader Service Card.

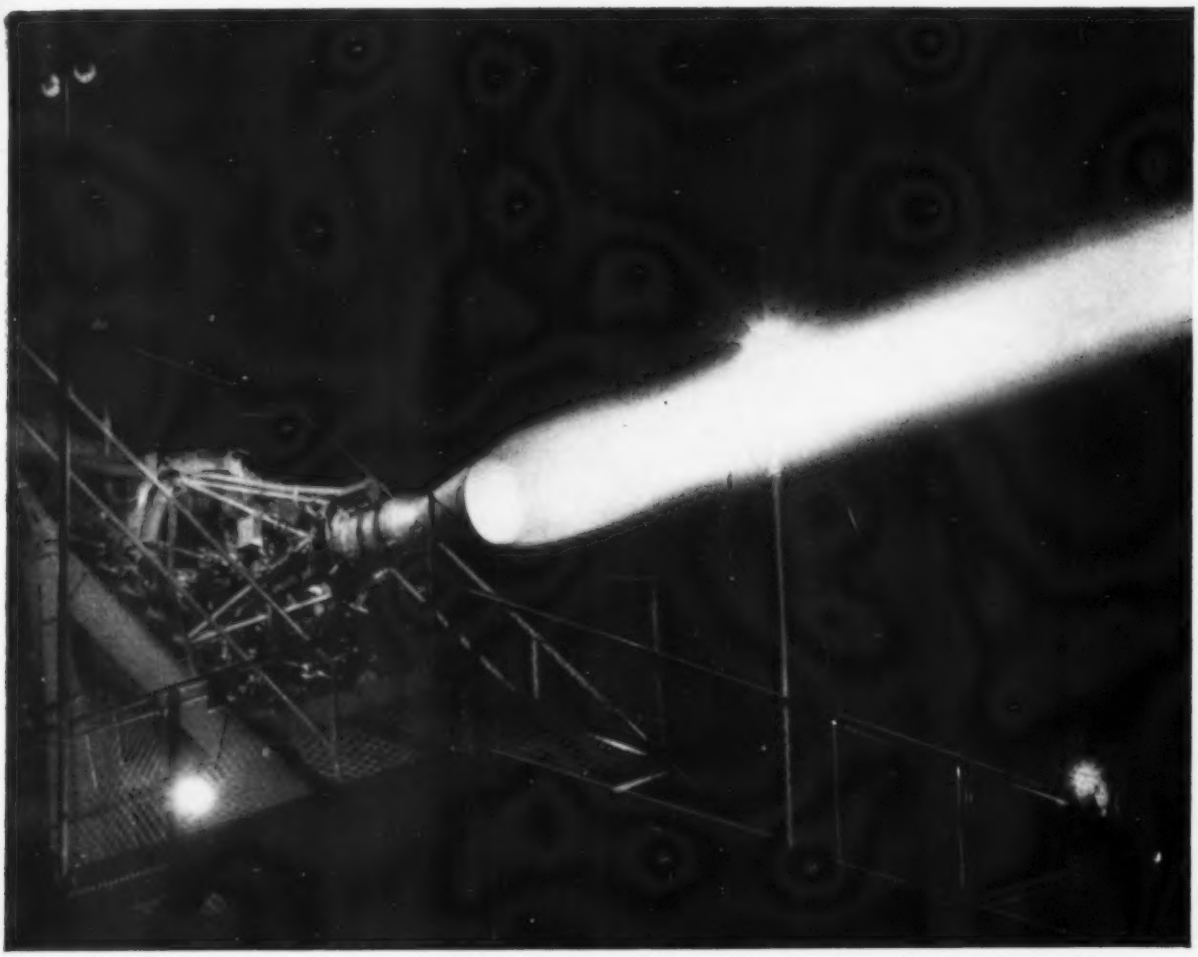
LIGHTPLANE AUTOPILOT

A tubeless and transistorless autopilot was recently introduced by Federal Telephone and Radio Co. It was designed for light or medium-weight private and business aircraft.

The gyro-servo unit, shown here being adjusted, is usually located aft of the baggage compartment. It uses high-speed servo motors controlled by a vertical gyro through sliding contacts that operate relays to power the motors. Power is applied through an electric clutch. Control take-off is through sprocket-driven chains coupled to control cables around a drum.

Circle No. 154 on Reader Service Card.

(*Continued on Page* 68)



Security restrictions permit us to show you only this unclassified Rocketdyne engine, a forerunner of today's more powerful units.

Rocket power for intercontinental guided missiles is here

Ten years ago this degree of power did not exist . . . but the future of our nation's guided missile program demanded it.

So when the ROCKETDYNE Division of North American Aviation, Inc., was given the task of creating such engines, they had to start practically from scratch. This meant new designs – including improved cooling methods and manufacturing techniques – that permitted temperatures greater than blast-furnace heat inside the engine, yet kept the outside cool enough to touch.

Engineers studied available fuels so that engine designs could extract maximum energy from every gallon. This called for new pumps . . . and turbines to drive them. Turbines, more powerful than 10 auto engines yet smaller than a car battery, were built. The completed engines, tested at ROCKETDYNE'S propulsion field laboratory in the nearby Santa Susana Mountains, have passed the rugged requirements of space flight.

This 10 year backlog of experience in all phases of rocket engine development and manufacture has made ROCKETDYNE the leading supplier of large, liquid-propellant rocket engines to our Armed Services and the guided missile industry.

ROCKETDYNE will welcome inquiries from engineers interested in this new field. Write ROCKETDYNE, Personnel Manager, Dept. A-12, 6633 Canoga Ave., Canoga Park, California.

ROCKETDYNE® *A Division of North American Aviation, Inc.*

BUILDERS OF POWER FOR OUTER SPACE

Another example of Farnsworth's pioneering achievements in the field of infrared.

Originally developed for the military this compact, light weight Viewer is proving equally useful in industry and science, wherever there is a need to see in the dark.

For complete details on the Infrared Viewer write Dept. V-56.

Farnsworth
A DIVISION OF IT&T

FARNSWORTH ELECTRONICS CO. • FORT WAYNE, INDIANA

a division of International Telephone and Telegraph Corporation

Circle No. 31 on Reader Service Card.

NEW PRODUCTS

INTERFERENCE SHIELD

A shield developed by the **Magnetic Shield Division, Perfection Mica Co.,** and United Air Lines keeps a C-band radar indicator cathode ray tube free of interference set-up by magnetic fields of the nearby tachometer.

Developed as a supplemental case for the tachometer indicator, the shield is made of newly developed shielding material, trade-named Fernetic, that may be obtained in different forms for high and low level attenuation of magnetic fields.

Circle No. 153 on Reader Service Card.

C-BAND MAGNETRON

A miniature C-band Magnetron, Type BL 206, has been developed by **Bomac Laboratories, Inc.** Tuning is adjustable by a set screw. The tube is said to withstand shock of 10,000 g's longitudinally and 1,000 g's laterally.

Frequency drift is rated at less than 0.05 mc at zero centigrade. Operating time is 7 seconds. Weight is 6.5 ounces. The tubes measure 1¼ x 3⅛ inches.

Circle No. 152 on Reader Service Card.

TWO-PIECE RIVET

The Cherry 700 rivet, latest addition to the line of the **Townsend Co.'s Cherry Rivet Div.,** is said to provide a wide grip range, positive hole-fill, high clinch and uniform stem-retention.

The Cherry 700 consists of a two-piece assembly, a sleeve portion and a stem portion. As the large diameter of

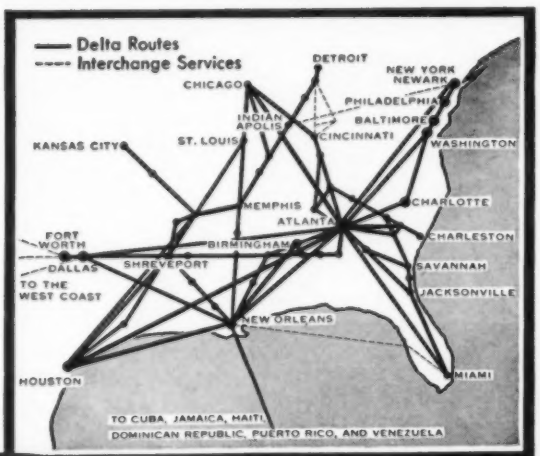
NOW... the hospitality of

DELTA DC-7's

between HOUSTON, Atlanta and New York

EXPERIENCE true Southern hospitality aloft as Delta —the South's own airline for over a quarter century— serves up Ranch-Hand breakfasts and broiled-to-order steaks for dinner on Golden Crown DC-7's. Ask for Delta's new Non-stop Golden Crown DC-7 flights between New York and Atlanta, and between Houston and Atlanta. Or save up to one-third by taking a Delta DC-7 nightcoach which stops at Washington and New Orleans too.

Also Golden Crown DC-7 service New York—New Orleans via Washington and Atlanta, and DC-6 day-coach service to Ft. Worth via Washington, Atlanta, and Dallas. For these services, as well as speedy new super-Convair flights to Charlotte, Baltimore and Philadelphia, call Delta Air Lines.



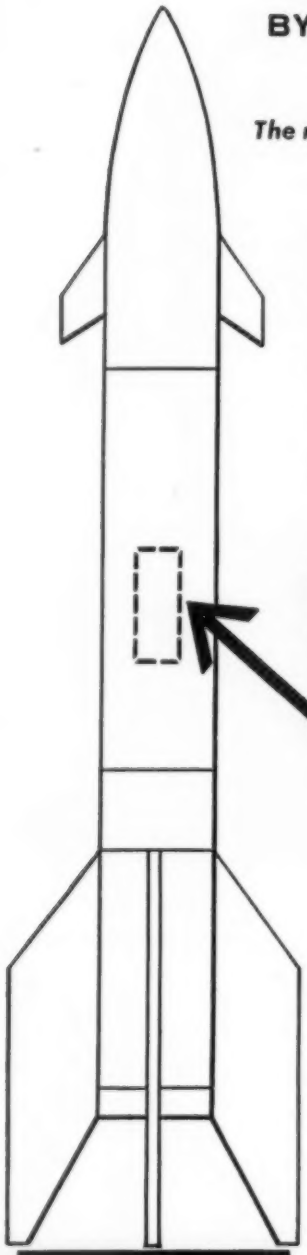
One of America's pioneer scheduled airlines.

Delta AIR LINES

See Your Travel Agent

General Offices: Atlanta, Ga.

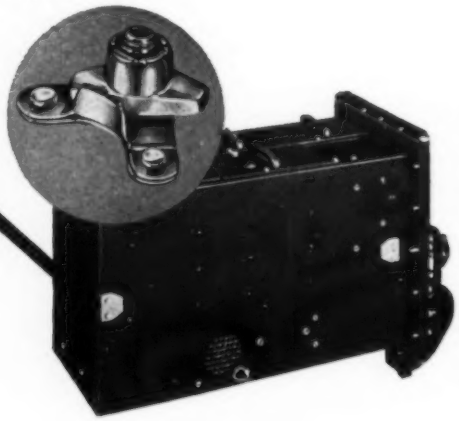
NEW PANELOC
ROTARY LATCH ADVANTAGES LISTED
BY BELL *Aircraft* CORPORATION



The next 135 words of this advertisement taken from Bell Engineers' letters

S. W. Esmond, Product Engineer:

- Electronic equipment shown was designed to use the PANELOC Rotary Latch at a great saving in space and weight, so vital to the aircraft engineer.
- Rotary Latch assembles to door or panel itself—no stud-to-receptacle line-up problem.
- Tests show no sheet separation—fastener locks with the effect of a nut and bolt assembly.
- Vibration tests also had no effect on the Rotary Latch.



F. P. Bassett, Project Engineer:

- Rotary Latch selected for use on cowl access doors on Bell's latest vertical-rising (VTOL) aircraft.
- The new PANELOC Rotary Latch is excellent for hinged doors and applications where maximum access and opening are important design considerations.
- Its simplicity, vibration resistance, ease of installation and cost are other factors that resulted in Bell's adoption of this new fastener.
- Now in use on fixed-wing aircraft, helicopters, missiles, electronic components.

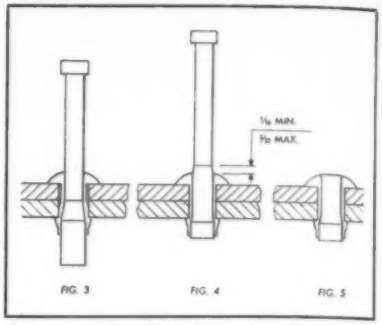
Write for catalog and price list for your file

A PRODUCT OF **SCOVILL**

Scovill Manufacturing Company, Aircraft Fastener Div.
44 Mill Street, Waterbury 20, Connecticut

Circle No. 21 on Reader Service Card.

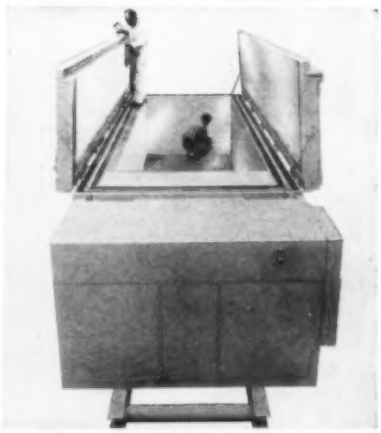
NEW PRODUCTS



the stem is pulled into the sleeve, the shank is expanded and draws the sheets together with a high clinching action.

Circle No. 168 on Reader Service Card.

ROCKET-TESTING EQUIPMENT



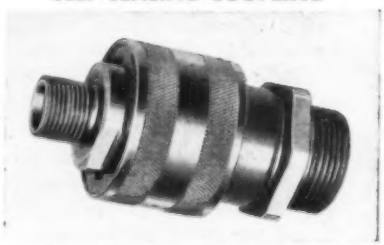
Moore & Hanks Co., working in conjunction with Pacific Refrigeration Co., has helped design an unusual piece of equipment for the testing of rocket motors by the **Aerojet-General Corp. of America**.

Unit measures 30 ft. x 8 ft. x 6 ft. A complete rocket motor can be lowered into the conditioning box and subjected to extreme temperatures ranging from 170°F to —100°F.

Equipment will handle an internal product load of 7,500 BTU per hour at —90°F. For higher internal heat loads at low temperatures, a supplementary liquid CO_2 injection system is provided.

Circle No. 169 on Reader Service Card.

SELF-SEALING COUPLING



A self-sealing hydraulic coupling that locks with a simple push has been introduced by **The Weatherhead Co.**,

PARTNERS IN PROGRESS . . .

NORTH CENTRAL

AND TWA

A salute to North Central Airlines, TWA interline partner, offering TWA passengers quick, reliable service between 42 key cities in Illinois, Michigan, Wisconsin, and Minnesota.

When business or pleasure takes you to the North Central states, you'll find North Central Airlines the ideal way to travel in comfort. North Central provides swift, dependable service to 42 key cities along the "Route of the Northliners."

TWA passengers enjoy the extra convenience of relaxing airline travel in these areas through an interline partnership between TWA and North Central, with connections at Chicago and Detroit. Over the years, North Central's record in serving the traveling public and the airline industry is a truly distinguished one. Congratulations from TWA!

Fly the finest... **FLY TWA**

TRANS WORLD AIRLINES

U.S.A. • EUROPE • AFRICA • ASIA

HOME OF THE FAMOUS

Hawaiian Room

● Just 3 minutes from New York City's Grand Central Terminal and conveniently near to the Fifth Avenue shopping district, the Lexington is centrally located. Its 801 outside rooms are all equipped with combination tub and shower bath, circulating ice water, full-length mirror, 4-station radio. Television.

"New York's Friendly Hotel"

Hotel Lexington

Near the United Nations

LEXINGTON AVE. AT 48th ST., N.Y.C. 17

"Call Your Local Travel Agent"

Aircraft seats?

then know JIM NULL...

As a top-notch General Shop Supervisor, Jim is a real "eye"—and how well he manages to keep sharply focused on the many phases of airline seat building work in our shops is a long story of customer satisfaction! Working with airline seats (it's a full-time effort at TECO) over many years has geared Jim's valuable experience to the job in a manner that helps assure that the finest airline seats are TECO-built!

TECO specialists and the full-time effort make the difference in engineering, styling and long service life—found only in TECO, the Airline Seat!

TECO INC.

3210 WINONA AVENUE • BURBANK, CALIFORNIA

IN CANADA: Railway & Power Engineering Corp. Ltd., Montreal • MIDWEST & SEATTLE: George E. Harris & Co., Wichita

Circle No. 22 on Reader Service Card.

NEW PRODUCTS

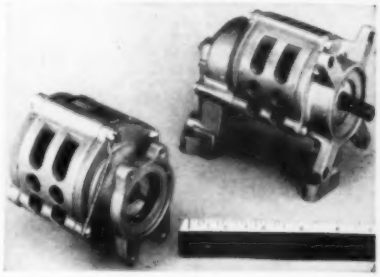
Aviation Division.

Trade-named the Weathco, unit couples against 60 psi in both coupling halves without twisting, turning or special tools. A pull on the coupling effects disconnection and positive seal for each half.

Operating sleeve stays in fully assembled position even when subjected to repeated accelerations of 35g. Locking device and sealing elements are located internally, avoiding danger of damage from bumping.

Circle No. 170 on Reader Service Card.

ROTARY-VANE AIR MOTOR



An air motor of a constant displacement, rotary-vane design developed by **Bendix Aviation Corp.'s Pacific Div.** is of special interest to those engaged in missile engineering and production.

Problem of locating a prime mover to operate an alternator and a hydraulic pump as an electro-hydraulic supply for a missile control system led to the development of the motor. Except for blades and bearings, it is fabricated entirely of aluminum.

Basic motor weighs 1½ lbs. and develops 2¾ hp per 100 psi of inlet pressure. Manufacturer says it will perform satisfactorily with inlet pressure of 300 psi. Overall efficiency approaches 70% at speeds of between 3,000 and 6,000 rpm.

The motor is qualified for missile applications over an ambient range of —20°F to 160°F and accelerations of 60 G.

Circle No. 171 on Reader Service Card.

ENGINE-HOUR METER

Air Associates, Inc. is distributing Hobbs engine- and flight-hour meters of the direct-reading type.

The engine-hour meter records actual operating time of the aircraft engine. It is installed with a pressure switch in the engine oil line, starting automatically as oil-pressure rises, stopping when the engine stops.

The flight-hour meter, installed with an air switch, indicates the number of hours the aircraft is actually airborne.

Hobbs meters are available in a range of voltages.

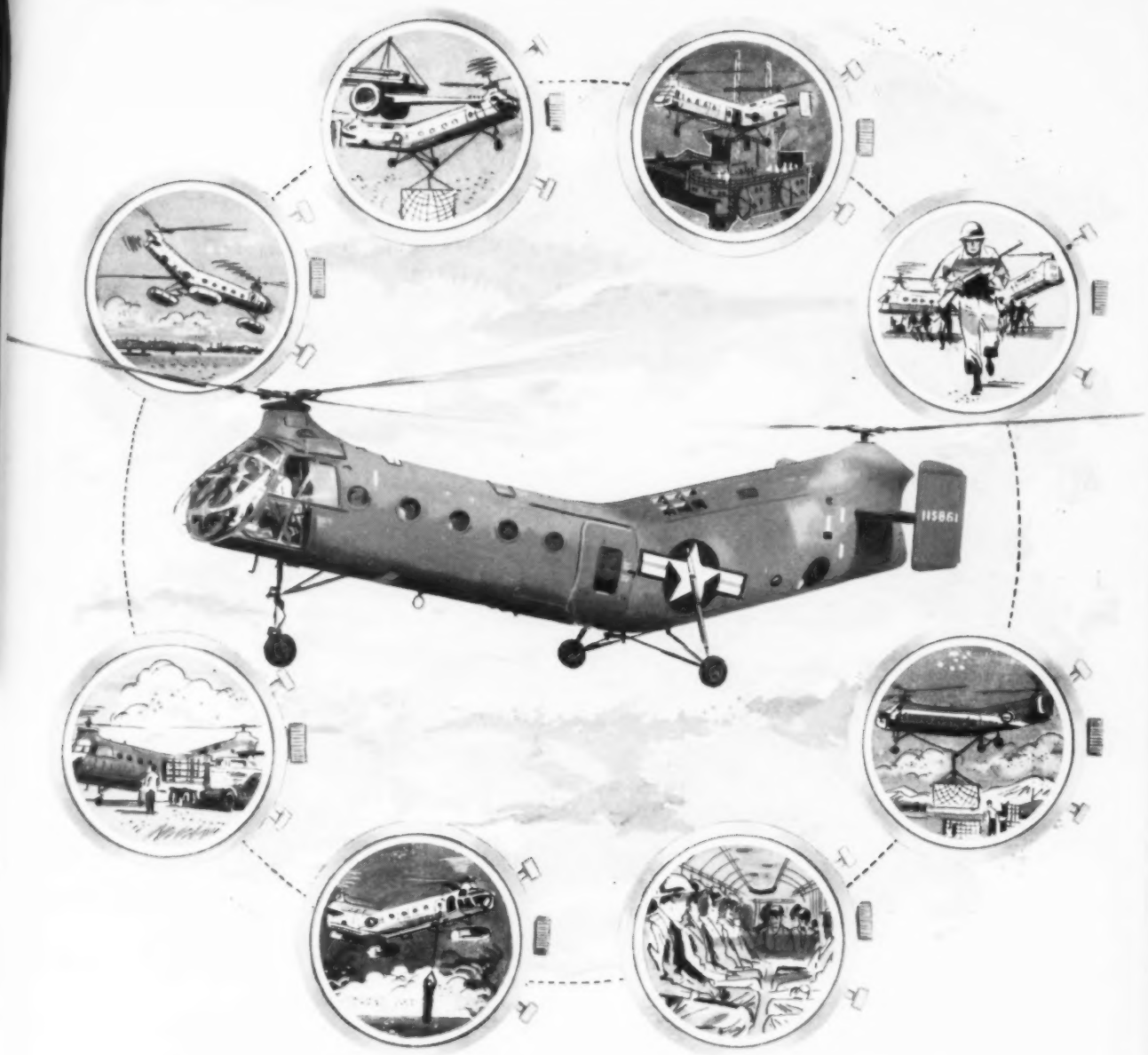
Circle No. 172 on Reader Service Card.

SUBSCRIPTION

ORDER CARD

SUBSCRIPTION

ORDER CARD



MOBILITY 'ROUND THE CLOCK

Every hour, every day—in almost every part of the free world Vertol helicopters are on the job.

They carry men and supplies to our remote radar outposts—the Distant Early Warning stations in the arctic, the Texas Towers off our coasts. They deliver assault troops in Atomic Age maneuvers, and haul cargo to locations out of reach of other vehicles. Bulk equipment is airlifted—flying crane fashion—over rivers and mountains.

Their naval duties range in scope from pilot rescue to ambulance and liaison missions.

Around the clock, around the world, Vertol helicopters are being picked again and again for *the toughest jobs.*

VERTOL

Engineers, join Vertol's advanced engineering team!

Aircraft Corporation

MORTON, PENNSYLVANIA

FORMERLY PIASECKI HELICOPTER CORPORATION

Circle No. 23 on Reader Service Card.

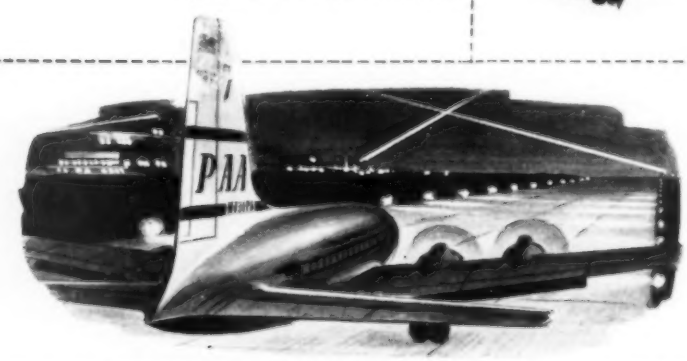
Aboard PAN AM's New Douglas DC-7Cs

3 SPERRY AIDS TO FLIGHT EFFICIENCY

Pan American has ordered the latest in Sperry flight aids for its luxurious new fleet of DC-7Cs . . . a continuation of its policy to give its passengers safe, smooth and comfortable flights regardless of weather . . . to help assure "on time" arrivals and departures. These Sperry instruments and controls supplement the skills of the crews and pay for themselves over and over again by assuring maximum flying efficiency.

Sperry Dual Integrated Instrument Systems

will give Pan Am pilots more flight data, in clearer visual form and in less space. This system consists of an extremely accurate primary direction instrument, a combined Zero Reader* flight director and gyro-horizon, and a pictorial deviation indicator.



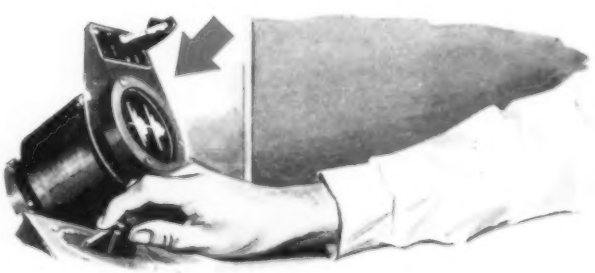
Sperry Flight Control Systems

will assure precise automatic control of aircraft on their intercontinental flights. Radio Beam Couplers fly the radio ranges automatically, and, in landings, the equipment responds to the localizer and glide slope beams for complete automatic approaches. Flight instruments, above, are combined in the systems for easy-to-read panel information.

Sperry Engine Analyzers

will enable quick pre-flight "tune-up" to assure smooth, maximum power. In the air, the equipment detects any ignition irregularity in the engine's performance which can be quickly corrected by adjustments or replacements immediately upon landing.

Our Aeronautical Equipment Division will be happy to supply further information on aids to flight efficiency.



*T. M. Reg. U. S. Pat. Off. Engine Analyzer is manufactured under John E. Liebel Co., Inc. No. 2-[illegible]

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International Aviation

By Anthony Vandyk

Some of the most dramatic aviation writing ever published is contained in a document just issued by the International Civil Aviation Organization with the prosaic title of *Aircraft Accident Digest No. 6.* It summarizes some of the masterpieces of aircraft accident investigation throughout the world in 1954.

The price of $2.50 would be justified merely for the profusely-illustrated summary of the British Comet investigation, one of 43 transport aircraft accident report digests in the 237-page volume. It also contains some valuable statistics and a list of new laws and regulations on accident investigation.

The ICAO digest shows that almost half—44%—of the accidents reported in 1954 occurred during the appproach and landing stages, and of these 30% were collision with terrain or water while 25% were due to undershooting the runway. About one-third—31%—of the accidents reported took place during the enroute phase (a 12% decrease when compared with the 1953 percentage); of these, 50% were collisions with terrain or water. The remaining 25% of the accidents reported occurred in the takeoff and climb stages. Of these 60% were during the initial climb phase.

• **Pilot error** was described as the probable cause in 60% of the accidents reported in 1954, an increase of 5% over 1953. Four of these pilot-error accidents were due to failure to carry out normal climb-out procedures and inexperience in emergency procedures. Three were caused by inadequate flight planning. Two collisions were due to failure to observe the other aircraft while 10 happened because approved approach procedures were not carried out, together with factors such as fatigue and reduced visibility.

Fatigue was mentioned as a contributing factor in several accidents. In one accident report it was stated that the time en route (22½ hours) and its extension for another 2½ hours strongly suggests the possibility of fatigue, specially during the last approach when the pilot showed poor adherence to the localizer path, slow response to wind shift, descent to a very low altitude and abrupt control action. On the other hand, another report comments that a period of 16 hours on duty is not generally thought of "as a long day for a crew to be on duty provided that adequate rest has been secured prior to the flight." The particular accident was attributed to negligence on the part of the pilot.

Vickers Boosts Vanguard Takeoff Weight

New data on the Vickers Vanguard turboprop transport show that the maximum takeoff weight has been increased to 135,000 lbs. The increase is solely due to using more of the wing torsion box as an integral tank and the associated beefing up. Payload remains the same—maximum payload as limited by the 98,500-lb. zero-fuel weight is 23,000 lbs. The designed maximum payload (nominal) is 21,000 lbs.

The higher gross weight enables the Vanguard's range to be increased. The still-air range with a 21,000-lb. payload is 3,150 statute miles without reserves or 2,600 miles with reserve fuel for an hour's holding at 5,000 ft. and a diversion of 230 miles (both figures include a 5% overall route reserve). In its long-range role the Vanguard can operate from a 6,000-ft. runway at standard atmosphere conditions at maximum takeoff weight, enabling it to carry a payload of 21,000 lbs. over the above distances.

Cruising speed at the 108,500-lbs. maximum landing weight will be 400 mph in 1958, increasing progressively with the upping of the power of the Rolls-Royce RB 109 Tyne to 425 mph by 1963. Fuel capacity is 6,125 U.S. gallons.

Despite the 25% gross weight increase, the Vanguard has changed very little aerodynamically. The major change is the use of two degrees of wing taper on the trailing edge to allow fitting of large-chord Fowler flaps. The engine efflux is now passed over the top of the wing from all four Tynes. No details of the structural design of the Vanguard have been released by Vickers.

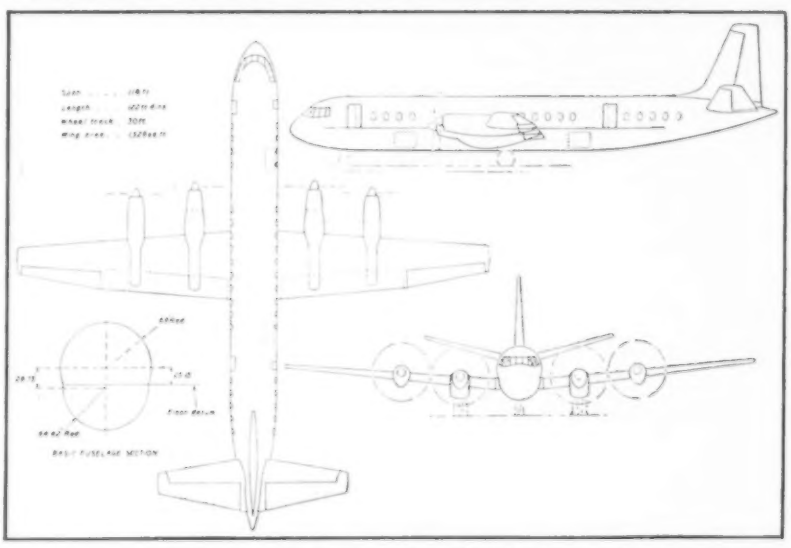
In first-class configuration the Vanguard can carry 76 passengers while in European type tourist configuration it can take 93. Cubic capacity of the main cabin is 4,524 cubic feet, plus 1,471 feet in auxiliary compartments. Cargo space volumetric capacity is 1,380 cubic feet.

AIRLINE BRIEFS

Japan Air Lines has ordered four DC-7Cs for delivery between December 1957 and April 1958 . . . **British European Airways** is planning to sell half of its 18-plane Ambassador/Elizabethan fleet next year and to cocoon the rest of the twin-engine high-wing aircraft. It will operate Viscount 700s and 800s on all trunk routes after the Ambassadors go out of service . . . **Ethiopian Airlines** has purchased a Convair 240 from SABENA Belgian World Airlines, bringing the former carrier's fleet to three 240s and eight DC-3s . . . **TAI**, French independent, plans to extend its Paris-Noumea route to Auckland, New Zealand.

BOAC has started a daily Viscount tourist service between New York and Bermuda in addition to its twice-weekly first-class Viscount flight over the route . . .

Vanguard Features Double-Bubble Fuselage



Latest drawings of Vickers Vanguard show double-bubble fuselage section as well as conventional top, side and front aspects of the turboprop transport.

TS

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Airlines Report Salaries Of Top Executives

The following carriers have filed with CAB Schedule E reports listing the 1955 salaries and other compensation of officers and directors:

American Airlines, Inc.—C. R. Smith, pres. & dir., $75,000 salary (up $1,815), no bonus and indirect compensation; Wm. J. Hogan, sr. v.p.-finance, $55,000 salary (up $7,293), no bonus & indir.; C. W. Jacob, sr. v.p. & secy., $55,000 salary (up $7,293), no bonus & indir.; O. M. Mosier, sr. v.p.-oper. & dir., $55,000 salary (up $7,293), no bonus & indir.; C. R. Speers, sr. v.p.-sales, $44,315 salary (up $11,828), no bonus & indir.; T. L. Boyd, v.p., $25,417 salary (up $417), no bonus & indir.; G. J. Brandewiede, v.p., $32,500 salary (up $786), no bonus & indir.; R. E. S. Deicher, v.p., salary $40,000 (up $968), no bonus & indir.; L. E. Glasgow, v.p. & controller, $28,105 salary (up $4,543), no bonus & indir.; W. H. Johnson, Jr., v. p., $30,605 salary (up $4,187), no bonus & indir.; P. W. Kayser, v.p., $21,250 salary (entered office 5/1/55), no bonus & indir.; W. Littlewood, v.p., $29,052 salary (up $2,217), no bonus & indir.; N. L. Smith, v.p., $10,807 salary (entered office 8/22/55), no bonus & indir.; R. W. D. Smith, v.p., $31,552 salary (up $2,611), no bonus & indir.; G. C. Van Nostrand, v.p., $29,052 salary (up $12,714), no bonus & indir.; Marvin Whitlock, v.p., $26,552 salary (up $2,990), no bonus & indir.; P. G. Larie, treas., $22,500 salary (up $794), no bonus & indir.; M. G. Beard, asst. v.p., $22,500 salary (up $288), no bonus & indir.; J. J. Casey, asst. v.p., $15,932 salary (up $1,254), no bonus & indir.; T. F. Holden, asst. v.p., $13,834 salary (entered office 7/20/55), no bonus & indir.; W. C. Lawrence, asst. v.p., $21,242 salary (up $2,999), no bonus & indir.; J. B. Montgomery, asst. v.p., $14,861 salary (entered office 6/15/55), no bonus & indir.; M. L. Rinehart, asst. v.p. & asst. treas., $24,052 salary (up $1,969), no bonus & indir.; E. O. Schroeder, asst. v.p., $24,052 salary (up $1,969), no bonus & indir.; M. W. Shipley, asst. v.p., $16,932 salary (up $2,000), no bonus & indir.; E. C. Taylor, asst. v.p., $14,917 salary (entered office 6/15/55), no bonus & indir.; V. J. Long, asst. controller & asst. secy., $20,000 salary (up $333), no bonus & indir.; C. N. Oursler, asst. controller, $20,794 salary (up $2,717), no bonus & indir.; W. J. Corbett, asst. treas. & asst. secy., $13,930 salary (entered office 5/18/55), no bonus & indir.; A. A. Paradis, asst. secy., $13,621 salary (up $788), no bonus & indir.; A. R. Bone, Jr., regional v.p., $24,052 salary (up $1,969), no bonus & indir.; W. M. Bump, regional v.p., $24,678 salary (up $2,595), no bonus & indir.; S. G. King, regional v.p., $24,052 salary (up $1,969), no bonus & indir.; H. J. Lyall, regional v.p., $15,613 salary (entered office 11/15/55) no bonus & indir.; M. D. Miller, regional v.p., $24,052 salary (up $1,969), no bonus & indir.; Harold T. Ames, dir., $900 salary, no bonus & indir.; James W. Aston, dir., $900 salary, no bonus & indir.; Harry E. Benedict, dir., $1,000 salary, no bonus & indir.; James Bruce, dir., $900 salary, no bonus & indir.; Edward H. Butler, dir., $700 salary, no bonus & indir.; Charles S. Cheston, dir., $1,400 salary, no bonus & indir.; Thomas M. Conroy, dir., $1,400 salary, no bonus & indir.; John W. Farley, dir., $900 salary, no bonus & indir.; Charles T. Fisher, dir., $1,000 salary, no bonus & indir.; James A. Jackson, dir., $500 salary, no bonus & indir.; Robert W. Miller, dir., $500 salary, no bonus & indir.; Edgar M. Queeny, dir., $700 salary, no bonus & indir.

Persons other than directors, officers and employes paid more than $10,000 for personal services were: Alvord & Alvord, Washington, D.C., legal, $12,000; Raymond E. Buck, Ft. Worth, Tex., legal, $11,500; Covington & Burling, Washington, D.C., legal, $282,500; Debevoise, Plimpton & McLean, N.Y.C., legal, $275,000; Kahn & Jacobs, N.Y.C., architects, $22,513; Naess & Murphy, Chicago, architects, $13,966; Skidmore, Owings & Merrill, Chicago, architects, $27,076; Arthur Young & Co., N.Y.C., public accountants, $40,944.

Bonanza Air Lines, Inc.—Edmund Converse, pres. & dir., $16,667 salary (up $1,667), no bonus & indir.; Florence J. Murphy, v.p., secy. & dir., $9,784 salary (up $1,159), no bonus & indir.; R. H. Herrnstein, treas., $10,834 salary (up $834.04), no bonus & indir.; Vi Geer, asst. secy., $1,145 salary (down $2,979.12), no bonus & indir.

Frontier Airlines, Inc.—C. A. Myhre, pres. & dir., $20,000 salary (up $5,230), no bonus & indir.; J. D. Lindsay, v.p.-traffic & sales, $12,000 salary (up $3,050), no bonus & indir.; E. N. Levin, secy. & dir., $7,800 salary (down $668), no bonus & indir.; L. P. Blatter, treas., $11,000 salary (up $2,532), no bonus & indir.; E. W. Sexton, Jr., asst. treas., $6,435 salary (up $285), no bonus & indir.

Persons other than directors, officers and employes paid more than $10,000 for personal services were: Rippey, Henderson, Kosta, advertising agency, $145,911.83; and Bowen & Scoutt, legal, $12,000.

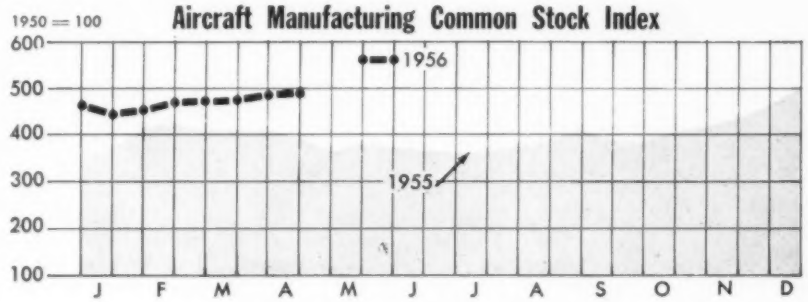
Lake Central Airlines—Gwin Hicks, pres. & dir., $15,000 salary (entered office 7/18/55), no bonus & indir.; L. W. Hartman, v.p., treas. & dir., $12,277 salary (up $2,108), no bonus & indir.; R. W. Clifford, v.p. & dir., $12,000 salary (up $451), no bonus & indir.; William H. Krieg, secy. & dir., no salary, $1,350 bonus & indir.; D. S. Getchell, v.p., $9,000 salary (up $550), no bonus & indir.; J. L. Cory, asst. treas., $7,778 salary (up $668), no bonus & indir.; R. B. Stewart, dir., $4,267 (down $933), no bonus & indir.; Harry V. Wade, trustee, no salary, $1,500 bonus & indir.; J. J. O'Connell, Jr., dir. (trustee), no salary, $800 bonus & indir.; J. Dwight Peterson, dir., no salary, $700 bonus & indir.; Cecil A. Berry, dir., no salary, $600 bonus & indir.

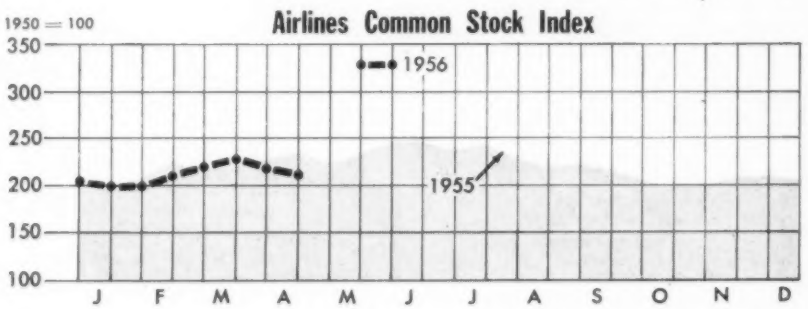
Persons other than directors, officers and employes paid more than $10,000 for personal services were: Albert F. Grisard, legal, $12,559.

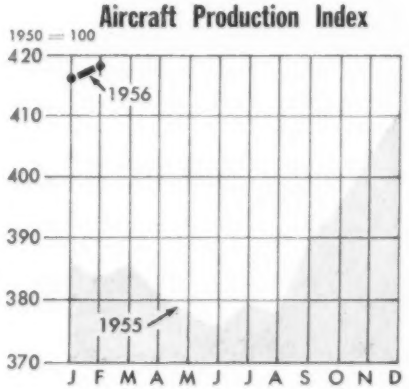
Braniff Airways—Charles E. Beard, pres. & dir., $60,000 salary (up $26,250), $4,365 bonus & indir.; J. W. Miller, exec. v.p. & dir., $39,000 salary (up $7,825), $2,790 bonus & indir.; R. C. Shrader, v.p. & dir., $18,000 salary (up $3,687), $1,215 bonus & indir.; C. G. Adams, v.p. & secy., $30,000 salary (up $7,500), $2,115 bonus & indir.; Rex K. Brack, v.p., $20,000 salary (up $5,525), $1,365 bonus & indir.; Malcolm Harrison, v.p., $18,000 salary (up $5,925), $1,215 bonus & indir.; Walter M. Henshel, v.p., $18,000 salary (up $3,750), $1,215 bonus & indir.; R. V. Carleton, v.p., $30,000 salary (up $8,500), $2,111 bonus & indir.; O. W. Crane, treas., $13,200 salary (up $1,725), $855 bonus & indir.; V. A. Kropff, asst. v.p., $12,600 salary (up $750), $810 bonus & indir.; R. L. Barrier, asst. treas., $10,140 salary (up $900), $625 bonus & indir.; F. J. Beisecker, asst. treas., $10,140 salary (up $900), $625 bonus & indir.; Loyd Eden, asst. treas., $10,140 salary (up $900), $625 bonus & indir.; Velta Bowlware, asst. secy., $4,800 salary (up $300), $225 bonus & indir.; Fred Jones, dir., no salary, $1,200 bonus & indir.; G. Butler, dir., no salary, $1,000 bonus & indir.; R. J. Whiteford, dir., no salary, $800 bonus & indir.; E. C. Eppley, dir., no salary, $800 bonus & indir.; T. N. Law, dir., no salary, $1,000 bonus & indir.; G. D. Murdoch, dir., no salary, $1,400 bonus & indir.; W. W. Flenniken, dir., no salary, $1,200 bonus & indir.; Milton McGreevy, dir., $1,000 bonus & indir.

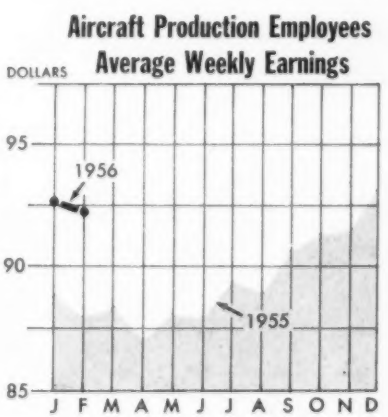
(*Continued on page 82*)

Pulse Of The Industry









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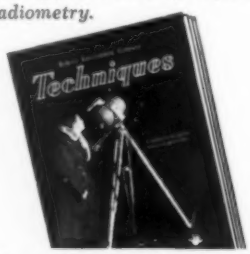

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West Coast Talk . . . By Fred S. Hunter

YOU HAVE to hand it to the boys at Douglas; they're always coming up with a new idea for an airplane to sell to the airlines. Latest is a new version of the DC-7C, which would be tailored to domestic carriers. It would be fast—about 375 mph on high blower. (A competitive speed advantage.) A plug in the fuselage would make room for two more rows of seats. (Ah, more revenue!) It would have low noise and vibration levels same as the present overwater DC-7C. (Better passenger comfort.)

Hunter

All this would be accomplished by taking advantage of Curtiss-Wright's plan to up the max. cruise power of its EA Turbo Compound engine from 1,810 to 1,950 hp on high blower. Engine would be available in the fall of 1957. That fits perfectly with Douglas's production schedule, which already runs the DC-7 line into 1958.

• •

Difference between the XF-104 prototype and the F-104A production plane in terms of thrust is on the order of 33%. This means the non-afterburner thrust obtained from the GE J79 in the F-104A is as great—or greater—than the total thrust, including afterburner, obtained from the prototype's Curtiss-Wright J65. Pour the coal to the F-104A and it runs away from the XF-104. And the latter, we might add, does a real job of running on its own account.

The F-104A actually is capable of attaining supersonic velocities even without the aid of its afterburner, the first airplane, so far as we know, with that distinction. In the transition from subsonic to supersonic speed, the only thing that happens in the F-104A is that the Mach number needle takes a jump. Lockheed pilots have flown it through Mach 1 with their hands off the controls. No trace of buffet.

• •

Air Force may decide on ducted fan engines for its projected long-range interceptors. Good specific fuel consumption is an essential for a plane in the LRI category, and this is one of a fan's best features. Both the North American and the Northrop LRI designs are heavy on stainless steel, too. In some quarters, they are referred to as stainless steel planes. Actually, however, they're only partially so.

• •

Air Force seems to be playing a numbers game with its guided missiles. Newest designation for North American's Navaho is WS-104 and for Convair's Atlas WS-107. These, we're advised, do not replace the old SM-64 and SM-65 missile designations, but are new numbers to describe the whole weapons system. Thus, for the Navaho, for example, the old designation XSM-64 continues to hold good for the vehicle, or airframe, itself. Moreover, if you happen to hear some one around North American mention the G-26, that's also the Navaho, although blessed if we know why. At Convair, the Atlas is the Model 7.

• •

Douglas added two feet to the height of the DC-7C's vertical fin to compensate for the changes in air flow produced by the new position of the nacelles farther out on the wing from the fuselage. But wind-tunnel tests indicate the Super Constellation's famous triple tail should do the job without need of alteration for Lockheed's Model 1649A, where a similar change in nacelle position takes place.

• •

Reports from El Segundo include sinister hints that Ed Heinemann's famous hot rod, the Navy A4D, is putting on a little weight. Well, it probably was inevitable. Airplanes just seem to have to get heavier as they go along and even so relentless a foe of the added pound as Ed Heinemann can't stop it.

• •

There's always a logical explanation for everything. Theodore Hardeen, Jr., Defense Air Transportation Administrator, reports why only 37 of Eastern Air Lines' 40 Lockheed Electras were approved for tax amortization certificates. Airline requests exceeded the 300-plane increase authorized by ODM and the government decided to grant applications in order of filing. There were 37 places left when EAL filed its application, and this left three planes over the limit . . . Jim Fischgrund says North American Airlines' legal battle with the CAB has cost it $500,000.

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Airport Consultants Draw Up Plans For Joint Auto-Aviation Facility

A unique airport development may soon get under way in the Tiffin-Seneca County area of Ohio that might well portend the future for similar small communities in the future. Finding the area's greatest potential lying in private and business aircraft growth, Leigh Fisher & Associates, airport consultants, have drawn up plans for a joint automobile-aviation facility.

Heart of the Fisher proposal is to provide landing-strip facility adjacent to a highway side. An automobile aircraft facility, he recommended, should be designed specifically for the purpose of obtaining revenue from the highway trade.

"The filling station should be designed to serve equally well in the fueling of aircraft and automobiles," Fisher said. "A coffee shop could be provided, which would be used by air trade when it comes in, but would be supported by highway trade, thus giving more financial stability to the operator. This combination air-ground facility is, in reality, a service station for transportation, air and ground. With slight modification, it can be equally suitable for a feeder line terminal building."

• **Fisher, who recently submitted** his report to the Tiffin Chamber of Commerce, noted that an analysis of the area showed "there is obviously only a limited air trade demand and while the growth of general aviation in the area will be greater than the growth of general aviation in the U.S. as a whole, a quantitative analysis does not indicate sufficient trade to warrant the operation of a full scale major public airport at Tiffin. The function of an airport is to develop aviation within the area so as to improve the transport and communication facilities for the area's people, business and industry. At the same time, an adequate airport should encourage the use of business and personal aircraft within limits of economic feasibility."

It has been predicted that Sandusky and Seneca Counties will contain 75 to 95 active civil aircraft by 1965 with the majority being four-place type and about 10% to 15% of twin-engine configuration. This, it is said, points to the need for an adequate paved and lighted flight strip for twin-engine executive aircraft in the Tiffin area.

A properly located landing-strip type facility, with reasonable fees, could well attract based aircraft from the surrounding area, Fisher said. He estimated "conservatively" that at least 18 aircraft would be based at the proposed facility in the first year of operation.

"To give business and personal aircraft enduring and real utility," the report observed, "an adequate, safe, financially-stable and permanent airport is an absolute requirement. Profitable and business-managed fixed base operations are absolutely necessary to foster, guide and encourage the use of aircraft.

"If such an operator exercises prudent financial management, he will make every attempt, in attaining financial stability, to reduce the cost to aircraft owners and users as much as possible, thus increasing their market and trade."

Cited as advantages of combining aviation and automobile facilities in the Tiffin area are: (1) increased trade opportunities to businesses located on the airport encouraging private investment; (2) excellent highway access; (3) integration of flight strip and highway maintenance, eliminating duplicating maintenance equipment and expenses; (4) roadside and airway-side park with picnic tables can be developed for the touring public at such a site; and (5) excellent key control center for air-ground liaison in case of defense emergency.

"The earning possibilities of this combination automobile-aircraft service facility," Fisher pointed out, "includes vehicular fueling, aircraft fueling, souvenirs, candy, cigars, cigarettes, food vending, and all the various types of automotive service and accessory sales. It is possible that the operator will find it practical to develop overnight motel facilities to serve primarily the highway trades."

• **The Tiffin Chamber of Commerce** reportedly has begun land acquisition at a site that meets the following requirements:

• Site should be on a numbered and paved highway.

• Area to be reserved for service buildings should be adjacent to both the proposed landing strip and the highway.

• Site should be considered primarily for single-strip development.

• Site should be expansible to a minimum length of 3,600 feet, with

Forney Plans June 1 Aircoupe Deliveries

Forney Manufacturing Company's Aviation Division expected to deliver the first five Aircoupes around June 1, J. D. Forney has announced. Based on the original Ercoupe introduced after the war, the Aircoupe has been modernized and features all-metal construction and a Continental 90-hp engine with McCauley metal props.

Billed as "a 2½-passenger" plane, it also has an improved cabin heater system, flush-type navigation lights, bubble-type windshield. The manufacturer now plans to produce its own VHF transmitter/receiver equipment designed specifically for the aircraft. It has been designed to fit into the glove compartment on the instrument panel. Forney Aircoupe will sell for about $5,000.

Vickers Servo Pump Systems

Provide rapid and accurate response to minute electrical or mechanical signals

The Vickers Servo Pump Unit shown at the right is a signal-controlled, variable delivery, positive displacement, reversible flow oil hydraulic pump. In combination with a rotary or linear hydraulic motor, it forms a signal-controlled hydraulic transmission for remote control operations and high-response servo systems.

The servo transmission may be considered as a power amplifier when viewed from the electrical signal input, of about five watts, to the mechanical power output of several thousand watts. Various sizes of transmissions have been built, having output capacity ratings from one to four hundred horsepower. The servo pump develops only that pressure required to move the load . . . which means reduced pressure over the greater part of the system life since peak loads occur only infrequently in the majority of systems. This greatly reduces power losses and minimizes heat rejection.

Any type of prime mover of sufficient capacity can be used to furnish the power input . . . electric motor, auxiliary drive pad on an airplane engine, air turbine, hydraulic motor, etc. Substantially constant speed is desirable.

Variable Pump Volume Controlled by Signal

Heart of the servo pump unit is the Vickers Variable Stroke Hydraulic Pump. This is usually a nine-cylinder pump housed in a pintle-mounted yoke. Varying the yoke angle varies piston stroke, hence, output volume from zero to maximum in either direction of flow. A stroking piston actuated by a pilot valve varies the yoke angle according to signal.

Low Control Power Requirement

Power for control purposes is low in a servo pump unit because metering valve action is confined to the volume-regulating system which is a low power level (100 to 300 psi) hydraulic system separate from the power transmission hydraulic circuit although a part of the pump unit. This volume-regulating system controls piston displacement and direction in the power pump which can operate at pressures up to 3000 or 4000 psi. Pressure drop across ports of a metering valve, with its inherent losses, is avoided in the power transmission system. Final power output from the pump is determined by the volume of flow which the volume-regulating system demands and by the actual resistance of the load . . . is not dependent upon pressure drop methods of control.

In a control system employing this servo pump, the variations in gain resulting from load change are negligible compared to those which may occur in a similar circuit controlled by a valve metering directly in the power line.

Constant Displacement Hydraulic Motor

Flow and pressure generated in the hydraulic pump are carried by tubing with no intermediate valving to the hydraulic motor or linear actuator. The fixed stroke hydraulic motor provides torque directly proportional to pressure and speed directly proportional to flow rate.

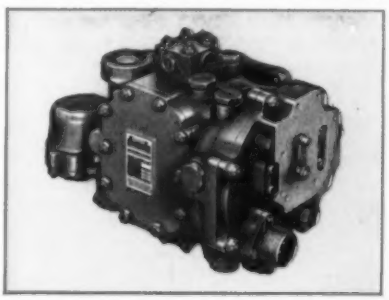
High Power-to-Weight Ratio

The servo pump unit and its associated hydraulic motor are designed for high power-to-weight ratio, high torque-to-inertia ratio, low inertia of rotating parts, and high resonant frequency.

Typical Example

High power-to-weight ratio—3.76 hp/lb (motor only)
High torque²-to-inertia ratio—3.5 x 10^7 lb-in./sec²
Low inertia of rotating parts— .052 lb-in.²
High resonant frequency— 20 cps (entire system)

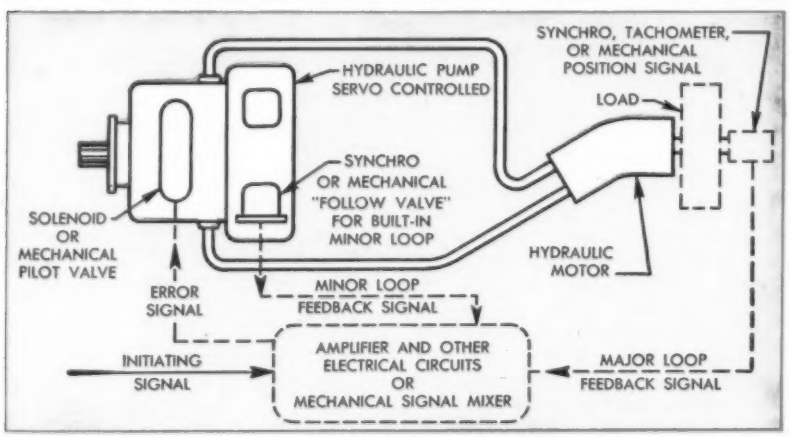
Other advantages are reliability and versatility of application. The smooth,



stepless speed changes and ability to hold position against any variation in load are additional reasons why this unit is a desirable resource which can solve many design problems.

Important among the applications of Vickers Servo Pump Units is extremely fast and accurate positioning of gun turrets on aircraft. Another is actuation of the exhaust nozzle for jet engines; here the servo pump's characteristic of providing at all times only sufficient power to meet the momentary demand minimizes the power loss and therefore the heat rejection. The greatly reduced average pressure level in this type of system prolongs the life and improves the reliability of all components.

For further information, ask for Bulletins SE-15 and SE-18 or get in touch with your nearest Vickers Aircraft Application Engineer. He can arrange for an engineering team to consider your problem and propose an optimum solution.


SYNCHRO, TACHOMETER, OR MECHANICAL POSITION SIGNAL
HYDRAULIC PUMP SERVO CONTROLLED
LOAD
SYNCHRO OR MECHANICAL "FOLLOW VALVE" FOR BUILT-IN MINOR LOOP
SOLENOID OR MECHANICAL PILOT VALVE
HYDRAULIC MOTOR
ERROR SIGNAL
MINOR LOOP FEEDBACK SIGNAL
INITIATING SIGNAL
AMPLIFIER AND OTHER ELECTRICAL CIRCUITS OR MECHANICAL SIGNAL MIXER
MAJOR LOOP FEEDBACK SIGNAL

SIMPLIFIED DIAGRAM illustrates a servo control system employing Vickers Servo Pump Unit and Constant Displacement Hydraulic Motor. This system accepts initiating signals (either electronic or mechanical, depending on type of system), compares them with feedback signals from load and (through controlled changes in direction and volume of fluid pumped to motor) corrects the load as required. For added accuracy and stability, a minor loop providing signals proportional to rate of flow may be added. This may either be built into the pump in the form of a mechanical "follow valve" which results in modulating the flow as a function of the net signal to the pump, or may be a synchro which feeds a signal proportional to flow rate into the amplifier. The controlled output may be either a function of the position or velocity of the load.

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DIVISION OF SPERRY RAND CORPORATION
ADMINISTRATIVE and ENGINEERING CENTER
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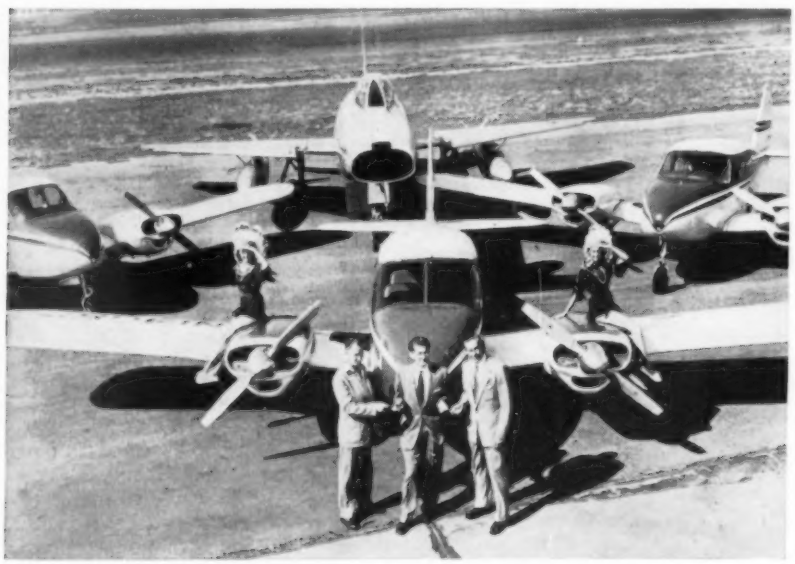
Engineers and Builders of Oil Hydraulic Equipment Since 1921

"Heavy" Plane Manufacturers Buy Light Planes

The aviation industry, like other businesses, has taken to executive flying. Douglas Aircraft Company, one of the leading manufacturers of airline transports, recently took delivery on a new Aero Commander 560A for its business fleet, shown beside the DC-7C. North American Aviation, a leading manufacturer of jet fighters, has purchased three twin-engine Piper Apaches for its Transport Flight, shown below with famed F-100 Super Sabre. Don Nomec (left), NAA chief transport pilot, and Mel Beach, flight hangar supervisor (right), accept keys from Warren Baird, Piper dealer, in Burbank, Calif. Apache twins are perched on nacelles.



both approaches clear to at least 40 to 1 at the expanded length and meet requirements of clear approaches.

• Center line of strip at closest point to highway should not be more than 750 feet to edge of highway right of way.

Fisher ruled against creating an airline-type airport on the grounds that Toledo's new airport will soon generate from 40 to 50 daily schedules coupled with Cleveland's 135 schedules. In lieu of trying to attract local service carriers at this time, Fisher has recommended that the population encourage and support convenient means of ground access to the two terminals supported by the development of good air taxi service from the new air strip.

The consultant estimated that first stages of construction and development with federal aid would cost about $145,050 and include: 125 acres of land; site preparation and drainage; a 2,000 foot runway; taxiways, ramp, entrance and access road, runway lighting and administration building. Facilities would be expandable to accommodate twin-engine executive aircraft including the Convair type. Estimated cost of extending the runway to 3,000 feet is $30,200.

Building area for the ground-air facility would encompass: combined fueling station, restaurant, service hangar, ultimate of 30 TEE hangars, motel units, necessary automotive and aircraft parking areas.

One method of financing recommended is for the County to enter into a contract with a private organization, leasing the airport for operational purposes with the private firm reimbursing the County for all costs of operation and supplying all necessary capital improvement funds.

"A lease of this type," the report said, "is substantially superior to a fixed-base operator manager type of operation where a fixed base operator obtains lease and operational privileges and also serves as airport manager for the owning agency." ◆◆◆

Airlines Report Top Executives' Salaries

(*Continued from Page 77*)

Persons other than directors, officers and employes paid more than $10,000 for personal services were: Whiteford, Hart, Carmody & Wilson, legal, $60,000.

Central Airlines—Keith Kahle, pres. & dir., $13,916 salary (up $1,916), no bonus & indir.; F. E. Howe, exec. v.p. & dir., $12,958 salary (up $958), no bonus & indir.; John L. Blackwell, v.p.-oper., $9,600 salary, no bonus & indir.; Alicia H. Pritchett, asst. secy., $4,380 salary (up $87), no bonus & indir.

Persons other than directors, officers and employes paid more than $10,000 for personal services were: Pogue & Neal, legal, $11,116.

Northeast Airlines, Inc.—George E. Gardner, pres. & dir., $25,000 salary, $5,000 bonus & indir.; A. A. Lane, v.p.-oper., $15,000 salary, $1,500 bonus & indir.; R. L. Turner, v.p.-sales, $15,000 salary, $3,000 bonus & indir.; D. W. H. MacKinnon, v.p.-engineering & maint., $12,000 salary, $1,500 bonus & indir.; Hamilton Heard, treas., $15,000 salary, $1,500 bonus & indir.; G. E. Reed, asst. treas., $8,700 salary (up $7,612.50), $250 bonus & indir.

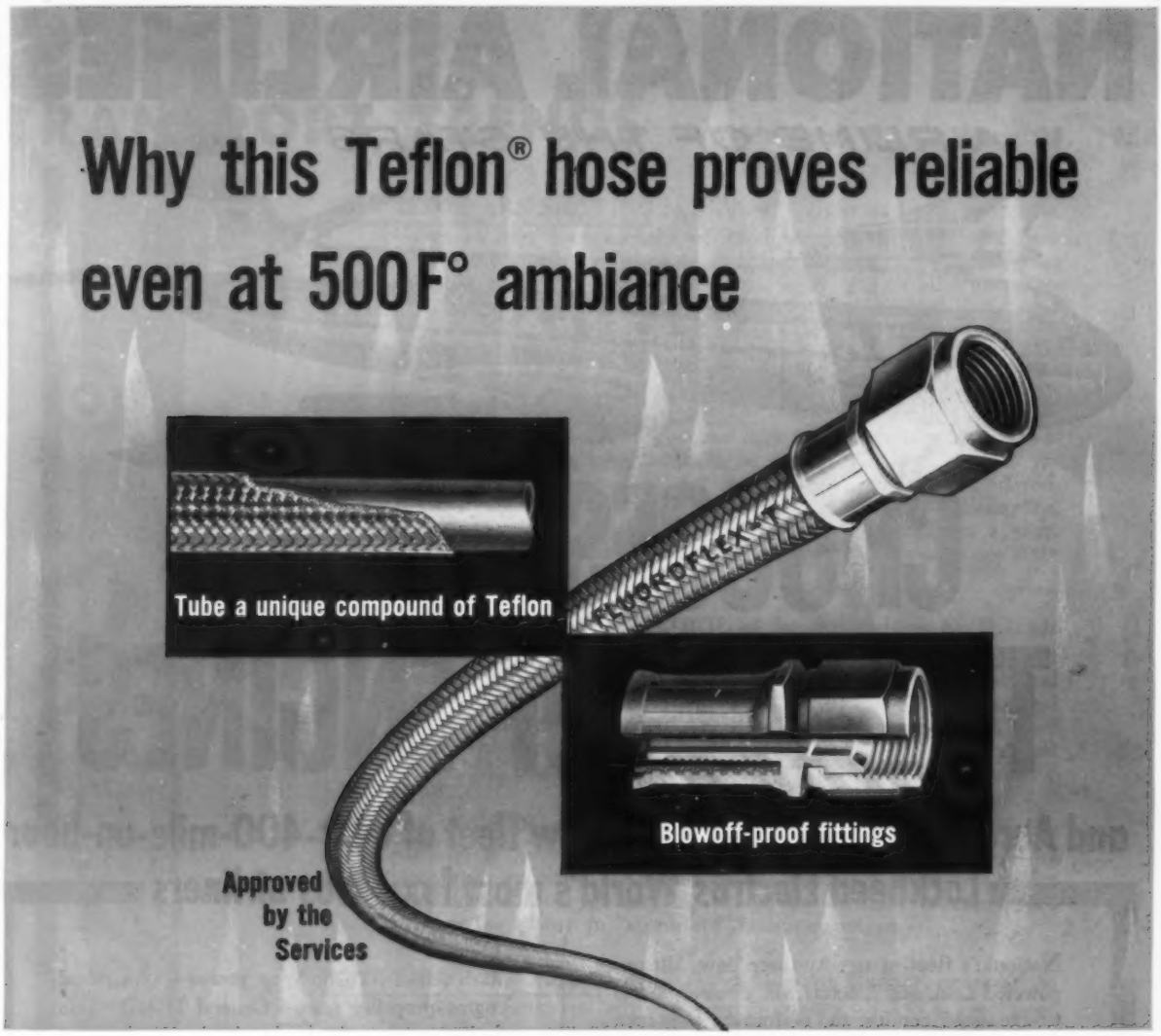
Persons other than directors, officers and employes paid more than $10,000 for personal services were Foley, Hoag & Eliot, Boston, Mass., general counsel, $52,600, and Lybrand, Ross Bros. & Montgomery, auditors, Boston, $15,390 (for 2-yr. period).

Trans-Pacific Airlines, Ltd.—Ruddy F. Tongg, pres., $13,700 salary (down $700), no bonus & indir.; David A. Benz, exec. v.p., $12,699.92 salary (down $700.08), no bonus & indir.; H. K. Hee, v.p., $7,800 salary (down $800), no bonus & indir.; Jacob Y. Ing, v.p., $7,200 salary (up $4,800), no bonus & indir.; Richard H. King, v.p., $11,350 salary (up $950.04), no bonus & indir.; Archie K. Wong, secy., $3,600 salary (down $800), no bonus & indir.; Clarence D. Young, treas., $9,550 salary (up $283.36), no bonus & indir.; Harry A. Bowen, asst. secy., no salary, $7,400 bonus & indir.

Western Air Lines, Inc.—T. C. Drinkwater, pres. & dir., $60,000* salary (up $5,000), no bonus & indir.; S. R. Shatto, v.p.-oper. & dir., $33,600* salary (up $3,600), no bonus & indir.; M. W. Landes, v.p.-service & dir., $28,100* salary (up $3,100), no bonus & indir.; P. E. Sullivan, v.p.-adm. & secy., $27,500 salary (up $2,500), no bonus & indir.; A. F. Kelly, v.p.-sales, $27,500 salary (up $2,500), no bonus & indir.; J. J. Taylor, v.p. & treas., $27,500 salary (up $2,500), no bonus & indir.; D. P. Renda, v.p.-legal, $27,500 salary (up $3,076), no bonus & indir.; G. G. Brooder, v.p., $5,000 salary (entered office 10/6/55), no bonus & indir.; C. J. J. Cox, controller & asst. treas., $17,600 salary (up $1,600), no bonus & indir.; E. H. Brown, asst. secy. & dir. of personnel, $10,560 salary (up $3,723), no bonus & indir.; Hugh W. Darling, dir., $550** salary, no bonus & indir.; Robert E. Driscoll, dir., $600** salary, no bonus & indir.; Hector C. Haight, dir., $600** salary, no bonus & indir.; Donald H. McLaughlin, dir., $600** salary, no bonus & indir., L. Welch Pogue, dir., $500** salary, no bonus & indir.; Joseph F. Ringland, dir., $600** salary, no bonus & indir.; John M. Templeton, dir., $200** salary, no bonus & indir.; Harry J. Volk, dir., $600** salary, no bonus & indir.; John M. Wallace, dir., $300** salary, no bonus & indir.; Alexander Warden, dir., $600** salary, no bonus & indir.; Sidley F. Woodbury, dir., $450** salary, no bonus & indir.

* Includes director's fees of $600.
** Director's fees only.

Why this Teflon® hose proves reliable even at 500F° ambiance



THIS HOSE has the exclusive Fluoroflex®-T tube . . . a special compound of Teflon. The unique extruding process developed by Resistoflex produces tubing that assures consistent high performance at high temperatures from Fluoroflex-T R500 hose. Its reliability is a matter of record.

As for the fitting, it's a compression type . . . for *permanent* reliability. It puts no damaging stresses on the stainless steel wire braid or Teflon tube. Over three years' *actual flying service* back up the positive protection this superior design gives against blowoffs at elevated temperatures and working pressures.

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RESISTOFLEX CORPORATION, Roseland, New Jersey; Western Plant: Burbank, Calif.

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ALLISON DIVISION OF GENERAL MOTORS

Indianapolis, Indiana

AMERICAN BUILT FOR THE JET ERA IN AIR TRAVEL

TRANSPORT TRENDS

Washington, D. C., May 21, 1956

SOFT SPOTS ARE SHOWING in airlines' freight and express traffic. Gains in first four months of 1956 weren't up to predictions. And some trunklines showed slight decreases. Experts say one possible cause is production cutback in automobile manufacturing industry, a big user of air express. Early predictions were for 17% to 20% jump in traffic this year. Sharp upturn will be needed to realize this kind of an increase.

●

CAB'S FARE INVESTIGATION ORDER leaves little room for a fare increase if the proceeding shows that tariffs are too low. Wording of the order, plus attitude of some top CAB officials indicate that only the need for a reduction will be considered. Impact on industry of an enforced fare cut could be disastrous. A 10% reduction would cost airlines over $100 million a year. Even a 1% cut would have wiped out 20% of last year's net after taxes.

●

PRESENT AND FUTURE CONTROL of foreign airlines by U.S. air carriers may soon get the government's blessing. This is out of tune with domestic control policies. But in the international field, situation boils down to this: if U.S. carriers don't control smaller companies, major European lines probably will. Test case, involving Pan American World Airways' one-third interest in LACSA, Costa Rican line, is now before CAB for decision.

●

CAB HAS ITS EYE on the airlines' no-show situation. Board officials consider it "very serious." Numerous complaints from passengers have been received. CAB also thinks lack of a no-show penalty or other controls results in a drain on airlines' revenues. It's looking for a way to "stimulate" industry action.

●

TIPOFF ON HOW CAB MAY ACT on Howard Hughes' proposal to build jet transports while retaining control of TWA (see page 17) may be seen in Sherman Fairchild case. Fairchild is a director of Fairchild Engine & Airplane Corp., which plans to build the Fokker F-27 turboprop transport. CAB ordered him to get off the board of Pan American World Airways (see page 88) because that company's subsidiaries and affiliates are potential F-27 customers. CAB lawyers working on the Hughes proposal are studying the Fairchild case thoroughly.

●

BATTLE IS SHAPING UP between Convair, Douglas and Lockheed for the medium-range transport market. Release by Eastern Air Lines of early delivery dates for 30 Electra turboprops on option is a key factor. It improved Lockheed's bargaining position in the face of Convair Skylark jet competition. Douglas is stepping up activity on DC-9 jet sales. Convair and General Electric reportedly have agreed to withhold announcement of Skylark orders until three carriers have signed up. TWA and Delta are rumored as first two prospects.

●

APPARENTLY STILL ALIVE are 1952 agreements between Pan American World Airways and De Havilland covering purchase of Comet jets. PAA officials say they have a continuing interest in the Comet and have certain confidential written understandings with De Havilland. Original firm purchase contracts are now believed to be option agreements. Comet IV production still looms as a highly uneconomical venture unless more buyers are forthcoming. Only 19 have been ordered by BOAC. Ranks of prospects are fast thinning.

N.Y.-Fla. Case Gives CAB Political Headache

Congress, both political parties, state and city officials get into act; New York's Mayor Wagner asked to judge PAA-Northeast issue.

By WILLIAM V. HENZEY

NO ROUTE case before the Civil Aeronautics Board in recent years has strayed so far from the quasi-judicial halls of the regulatory agency as the pending New York-Florida Service Case.

Congress, both major political parties and cities (many divided within themselves) are fighting the case with more gusto and considerably less finesse than the usually belligerent airline parties. Governors, mayors, other civic officials and newspapers all along the east coast have had their say on how the case should be decided.

• **To illustrate** how far afield the case has gone, consider this lead paragraph in a May 8 item in the *New York Times:* "Mayor Wagner promised after a conference yesterday with officials of Northeast Airlines that he would study that company's petition to become the third carrier on the busy air route between New York and Miami."

The item was in reference to a defense Northeast was forced to employ since the City of New York had gone on record in favor of Pan American World Airways' application for Boston-New York-Miami service. It followed by several days the appearance of officials of Eastern Air Lines and National Airlines before Mayor Wagner and preceded by one day a similar appearance by Delta Air Lines, all in opposition to the City's stated position.

"It is the position of the City of New York," the City said in an April 19 statement to CAB, "that the CAB Examiner erred in failing to recommend certification of Pan American World Airways" as the third carrier between New York and Miami.

Consider, if you will, airlines engaged in interstate commerce who get their licenses from the Federal Government being forced to appear before the mayor of a city to argue their cases which are to be decided by a Federal body and which, in fact, have gone through virtually all procedural steps short of such a determination.

• **In fairness** to Mayor Wagner it should be pointed out he was giving "other carriers" their say. But the position he was forced to defend, taken by New York City Corporation Counsel Peter Campbell Brown, was one which the City adopted after allegedly "extensive consideration" of the record in the CAB case and the briefs and comments of the various parties.

Thus, the mayor was in the process of doing what the city had said it did before supporting a particular carrier.

And if that inconsistency is not enough, weigh the fact that the Port of New York Authority, which normally speaks for the entire New York area in CAB proceedings, was on record with its traditional plea for improved service but without specifying any particular applicant to perform the service.

New England Delegation United

And while New York illustrates the point, it is not alone in conducting its own private version of the CAB case. In fact, New England generally hasn't seen such a united front since the days of the Minute Men. The entire 12-member senatorial delegation of that area—Republicans and Democrats—has expressed its opposition to the April 3, 1956 report of Examiner Thomas L. Wrenn which recommended Delta as the third carrier between New York and Miami.

• **The Congressional group,** in a joint letter to CAB Chairman James R. Durfee, expressed "deep concern over the possible adverse effect on New England of the initial decision" of Examiner Wrenn.

In addition to suggesting Delta's route between New York and Miami, Wrenn recommended new services in the Boston, New York and Washington area by Eastern, National, TWA and United. He would deny applications for Boston-New York-Miami service of Northeast, Pan American, Capi-

Where Continental Will Overhaul Jets

Here's how artist views proposed $4.5-million turbine engine overhaul and maintenance base to be built by Continental Air Lines at Los Angeles International Airport. First two stages, each costing $1,250,000, will be completed in March 1957 and early 1958, respectively. Final stage, costing $2,000,000, is planned for 1959-1960 and will enlarge CAL's installation by 50 percent. Airline is negotiating with Los Angeles city and airport officials for 30-year lease of 25-acre plot near site of a proposed new terminal for airport.

tal, Resort, Riddle and North American.

For that recommendation, Wrenn, one of the Government's most capable and experienced hearing examiners, has alternately been praised and castigated. There is nothing abnormal about disagreement with an examiner's recommendation; in fact, there is adequate provision in the law for any disagreeing party to express its views *on the record*.

But when, for example, a United States Senator, on the Senate floor, terms an examiner to be "out of order" for giving his best judgment, the sanctity of a man's "day-in-court" before CAB borders on the frivolous.

CAB on Spot—Either Way

• **When an entire** Congressional delegation goes on record against a recommendation for a particular carrier or carriers, it is, perhaps unwittingly, hurting not only the carrier with the examiner's favorable recommendation, but the carrier or carriers it purports to support. For if CAB grants the route to the carrier or carriers so supported, it will be subjecting itself to open criticism for bowing to Congressional pressure.

Unfortunately, there are few airlines in the same case who haven't "waged their case" beyond the confines of the proceeding before CAB. In some instances, airlines are accused of stirring up Congressional and city ire. Such a situation has a snowballing effect for if one carrier is successful in pressure-type tactics, others must resort to similar means or lose their case for the modern day version of "lack of prosecution."

On June 26, the case will move back to the rightful confines of CAB's oral argument room. There, as provided by law, any objecting parties can have their say on the record before the full Board.

CAB cases will become a farce unless the prescribed procedure is adhered to. In fact, they'll become superfluous if civic groups, politicians, etc. wait until they can't be cross-examined to express favoritism for a particular company. The decision in the New York-Florida Case—the one by CAB, that is—should be issued this summer. ◈◈◈

Brazilian Airline Orders 10 F-1 Safaris

The Frye Corp. has received an order for ten F-1 Safari, four-engine transports from Cruzeiro do Sul. The Brazilian airline's order relates to a P&W Wasp-powered passenger-cargo version of the aircraft, carrying 25 passengers, a three-man crew and up to 4,500 lbs. of cargo for delivery in the latter part of 1957.

President Jack Frye says options have been taken on 42 of the first 100 delivery positions. Last March Northern Consolidated Airlines and Wien Alaska Airlines agreed to buy the F-1 if it went into production. The former ordered three with an option on two more, while the latter ordered three.

KLM's Solution for Footsore Passengers

KLM Royal Dutch Airlines is using these specially designed buses for passenger-handling at airports. The ultra-low walk-in doors at side and rear make for each entrance and exit.

The airline reports passengers have expressed great satisfaction with this common-sense approach to cutting down handling time and providing shelter between airplane and the terminal area.

Note the three big folding doors and the low floor. Top photo shows the easy, ground-level access door at rear and the roomy interior.

The Dutch airline's engineering staff, headed by vice president J. Luymes, designed the new vehicle, here shown at Schiphol Airport, Amsterdam.

All Signs Point to Lower Transatlantic Fares

The United States may not present a united front when the International Air Transport Association holds its traffic meeting in Cannes, France on May 29, but at least the differing views all will be pointed in the direction of lower transatlantic air fares.

Three major U.S. parties involved in that issue are the Civil Aeronautics Board, which wants lower tourist fares *per se;* Pan American World Airways, which wants a new third-class fare from 15% to 20% below present tourist fares, and Trans World Airlines, which advocates a new 15-day year-around round-trip excursion fare of $350 New York-London, with similar reductions to other TWA foreign points.

• **The present** IATA fare structure has CAB approval through September 30, this year. Board has served notice that it will not approve the same structure beyond that date and, instead, wants tourist fares lowered.

The Pan Am and TWA proposals are in line with that directive although sentiment across the ocean is far from unanimous either on the general principle of a fare cut or the individual proposals advanced by the American lines.

Current situation is that CAB is weighing the offers of Pan Am and TWA, plus its own staff's recommendations, and will come up with a statement

of position it desires followed at the Cannes meeting.

• **Meanwhile,** activities of the North American Airlines group aimed at a low-fare transatlantic service may have gotten the non-scheduled group in a new peck of trouble with the U.S. Government.

Both CAB and the Department of State are investigating the possibility that North American, in negotiating a unilateral deal to operate into Luxembourg, may have violated a 1943 joint CAB-State policy statement forbidding such unilateral efforts.

North American has sought three times in recent months to get a CAB exemption for transatlantic operating rights but has been turned down twice (the Luxembourg proposal is still pending) on grounds that the issues are too complex to be decided short of public hearings.

Lockheed Planning Long-Range Jet, Too

Lockheed Aircraft Corp. is not surrendering the turbojet market to competitors by devoting its present attention to the Electra turboprop, and when the company's big long-range jet finally appears, it will really "step out," according to Lockheed president Robert E. Gross.

Gross said Lockheed believes its Electra can compete with small jets proposed by Boeing, Convair and Douglas because it will be the most economical plane. The company concluded, after extensive studies, that it would be uneconomical to build a small jet, he added.

Commercial version of the Lockheed C-130A Hercules turboprop cargo transport will have a larger, different fuselage and its gross weight will be more than the 124,000-lb. figure set for the military version, he said.

Trans-Canada Orders 4 Conway-powered DC8s

Trans-Canada Air Lines has become the first airline to order the Douglas DC-8 powered by Rolls-Royce Conway bypass engines. TCA's $28 million order is for four planes, to be delivered in early 1960, with an option for two.

TCA president G. R. McGregor said the Conway DC-8 was ordered after "very extensive analysis of every logical type of long-range aircraft and engine expected to be available in the next four or five years." TCA's satisfaction with previous Rolls-Royce engines played a major part in the choice, he added.

The commercial version of the Conway will develop 16,000 pounds thrust. Price is $280,900, slightly more than the Pratt & Whitney J75. It is lighter than the J75 and has slightly lower fuel consumption. Outside noise level is 12 decibels less than that of a conventional jet engine, and noise suppressors can reduce this further.

Among other airlines said to be interested in the Conway DC-8 are BOAC, Qantas and Air-India International.

McGregor indicated that additional TCA equipment orders are pending. He said, however, that it is not interested in the Bristol Britannia because "it will go on the Atlantic three years ahead of the jets, but will have a short life and a merry one."

Spain's Largest, Fastest Transport

Flying with one of its Bristol Hercules engines stopped, CASA 207 Azor is currently undergoing its flight test program. It is Spain's largest (33,000 lbs. gross) and fastest (263 mph) transport.

Rumored Merger of BEA With BOAC is Denied

A flat denial that there is any prospect of merging British Overseas Airways Corporation with British European Airways, or denationalizing either of the corporations, has been made by Gerard D'Erlanger, newly appointed Chairman of BOAC.

D'Erlanger objected to the term "part-time Chairman" and said he considered himself a "non-executive Chairman" which was quite a different thing. His policy will be to delegate all executive duties: current work, with complete executive authority over all departments, will be handled by Managing Director Basil Smallpeice. Overall organization planning and outside liaison left to Deputy Chairman Sir George Cribbett.

First active task of the new management is to review BOAC airplane requirements and report to the Ministry of Transport and Civil Aviation. For this a committee has been set up with D'Erlanger as Chairman, Cribbett, Smallpeice, Sir Victor Taits as Operations Director, Keith Granville Sales Director, Campbell Orde Operations Development Director, Charles Abell Chief Engineer and Captain Tom Farnsworth, the senior pilots' nominee.

This review is being treated with utmost urgency but any recommendations to purchase American airplanes would be subject to sanction by the British Treasury.

CAB Again Rules Out S. M. Fairchild as Director

Civil Aeronautics Board has given Sherman M. Fairchild, Pan American World Airways and Fairchild Engine & Airplane Corp., 60 days to meet a one-year old CAB order disapproving Fairchild's service as a director of PAA. He is also a director of FEAC. Board's disapproval is based on interlocking relationships which may be adverse to the public interest in view of FEAC's recent decision to go into volume production of the Fokker-type F-27 turboprop aircraft.

Second Caravelle Prototype Makes First Flight

The second prototype of the SNCASE Caravelle made its first flight late last month. Air France will start proving tests with the first prototype in a few days.

The jet transport will be operated on a scheduled basis for 500 hours of testing on the routes between Paris, Toulouse, Marseilles and Algiers.

No passengers will be carried but company cargo will be transported in the aircraft. Air France has decided that the Caravelle will be equipped to accommodate 80 passengers.

CAB Renews Lufthansa Service to N. Y., Chicago

Civil Aeronautics Board has issued a renewed foreign air carrier permit to Lufthansa German Airlines authorizing service (1) between Germany, the intermediates Brussels, Paris, Manchester, Shannon and Gander, and the terminal New York, and (2) between Germany, the intermediates Brussels, Paris, Manchester, Shannon, Gander, Montreal and Windsor, and the terminal Chicago.

Airline Commentary

By Eric Bramley

During recent travels we rode with an airline that has instituted the self-claim baggage system. Upon arrival we picked up our bag and offered the porter the check. But he waved us on through and wasn't interested, so we ended up with the bag and the check. Others had the same experience. This looks like a dangerous way to do business. There are a few sharpies traveling today who would take particular delight in using their checks to enter claims for "lost" bags. Could be expensive.

* * *

One airline that offers alcoholic beverages for sale on some flights tells us that it's making between $5,000 and $6,000 a month off the bar. This is after all charges, including expenses of one cabin attendant. A tidy profit.

* * *

The airlines vice presidents-sales and their reservations experts went round and round again on the no-show problem at the Air Traffic Conference meeting in Minneapolis this month. And again there was no agreement on a no-show penalty, time limits for ticket pick-ups, etc. The problem was referred to a committee, which was given certain terms of reference. Another ATC session will be held in Chicago June 20.

In the halls of the Radisson Hotel after the meeting you could get almost any kind of an opinion on whether next month's confab will produce any results. We were offered 10 to 1 odds against a penalty plan, an even money bet, and 9 to 1 in favor. With splits of this kind, we're pessimistic. But a genuine attempt is being made to do something. We hope a solution is possible.

* * *

"Royal Coachman," catchy name of American Airlines' new DC-7 non-stop transcontinental coach, was the idea of AA's No. 1 fisherman, president C. R. Smith. As all fishermen know, Royal Coachman is a well-known and effective artificial fly.

* * *

With reservations costs rising and the no-show problem as bothersome as ever, a trunkline is giving serious consideration to inaugurating a coach schedule on which your ticket would be your reservation. First-come-first-served, and the fare would probably be a little lower than regular coach.

Sales, Traffic, Promotion

A small, handy "thumbnail guide" giving latest information on the forms required for shipping by international air parcel post has been issued by **Air Transport Association**. . . .

Frontier Airlines has a novel deal with the Denver Bears baseball club. It's flying the Bears on all 1956 road trips in a DC-3 owned by the team. Frontier furnishes crews and maintenance. At the end of the season, the plane becomes part of the airline's fleet. . . .

TWA's current timetable has a "new look." First three pages are now devoted to a series of condensed schedule boxes covering all **TWA's** competitive flights on major route segments. Typography is better; some confusing guide lines have been eliminated. In international schedules, each city name is listed only once to eliminate arrival and departure confusion. . . .

Unusual **Capital Airlines** direct mail piece shows pattern of Viscount service available between New York and Washington and Chicago . . . Capital has inaugurated Viscount schedules to New Orleans, Mobile, Birmingham and Atlanta . . . Company will soon open a new reservations and sales office on the 13th floor of the Tutwiler Hotel, Birmingham, and a new ticket office at Marietta and Forsyth Sts., Atlanta. . . .

Attractive and useful 20-page "travel tips" booklet has been issued by the Lady Sabena Club of **Sabena Belgian World Airlines.** Includes tips on clothing to take abroad and includes a suggested wardrobe for ladies traveling on tourist flights (weight of clothes is 36 lbs., allowing eight lbs., for purchases abroad to make up the 44-lb. baggage allowance). Booklet also contains customs regulations, required vaccination, how to obtain U.S. passports, suggested scale of tipping, etc. . . .

American Airlines has started its "deferred" airfreight service between Los Angeles, San Francisco, Chicago, New York and Washington. Service differs from regular airfreight in that shipments generally won't be released at destination until fourth day following shipment. It's designed to provide faster delivery than normal surface competition but at comparable rates. . . .

New **United Air Lines** folder plugs the "Republic," the "first and only" DC-7 Washington-San Francisco "red carpet" non-stop . . . **Trans-Canada Air Lines** is leasing a private line telephone system to handle passenger reservations. Toronto serves as control center . . . Port of New York Authority color folder describes New York International Airport's facilities, also covers building plans. . . .

Plastic Serving-Tray Box Keeps Food Cold

Plastic serving-tray box that keeps portions of flight meals chilled up to 12 hours has been developed by Pynn-Hawley Co., Rutherford, N. J. Pan American, Capital and Trans-Canada are now using the boxes, said to be lighter and easier to clean than metal containers. Trays and carriers are molded by Pynn-Hawley from glass fibers and Vibrin polyester resins made by Naugatuck Chemical division, U.S. Rubber Co. Box holds 14 trays and three pounds of dry ice. Hot portion of meal is added after tray is removed from container.

UAL Survey Shows Passengers Favor Liquor

Eighty percent of United Air Lines' passengers and 100,000-Mile Club members questioned recently feel that liquor service should be permitted aboard airplanes, while 17% were opposed and 3% had no opinion. The survey covered over 7,300 persons.

W. A. Patterson, UAL president, said 88% felt they would "usually" or "sometimes" accept a complimentary drink, and 85% said they would pay for a drink. Eighty percent felt liquor service should be controlled either through limiting drinks or restricting the time of service, or both.

"It is our intention to continue our liquor service just as it is at present," Patterson said. UAL's policy is to offer one complimentary drink. Passengers who do not want a drink are "promptly served their complete meals," he added.

FCC Proposes Changes In Antenna Rules

The Federal Communications Commission has proposed that its rules be amended in conformity with recommendations of the Joint Industry-Government Tall Structures Committee on grouping and location of antenna towers to reduce hazards to air navigation.

The Air Coordinating Committee last October approved recommendations that called for grouping of antenna towers more than 500 feet above ground, multiple use of existing structures for antenna location, and location in areas designated by the Airspace Panel of the ACC as acceptable from an areonautical point of view.

Under the proposed rules, applications for permits to construct new radio or TV stations, or to change locations would not be granted unless the grouping and location rules are met, or adequate showing made that they cannot be met and that proposed locations would not constitute a hazard to air navigation.

TRANSPORT BRIEFS

• **John Gilbert Graham** was convicted of first degree murder by a Colorado jury in the sabotaging of a United Air Lines' DC-6B that crashed and killed 44 persons, including his mother. Verdict carries an automatic death penalty.

• **Helicopter Air Service,** Chicago, has ordered six new Sikorsky helicopters. Company's bid for passenger rights and certificate renewal is now before CAB for decision. Helicopters ordered include three six-passenger S-55s at $160,000 each and three 12-passenger S-58s at $300,000 each. One S-55 will be delivered in June, and two in July. First S-58 will be received in February, 1957.

• **A total of** 19,480,000 aircraft operations was reported for 1955 by CAA, a 9% gain over 1954. Ten busiest fields, in order, in total operations (air carrier and itinerant) were: Chicago-Midway, Miami, LaGuardia, Los Angeles, Atlanta, Denver, Charleston, S. C., Cleveland, Washington, and Teterboro, N. J.

• **TWA bought** a surplus Fairchild C-82 which will be based in Paris for overseas engine carrier work formerly handled by a Douglas C-47.

• **CAB Examiner** Barron Fredricks recommended that Allegheny Airlines' route 97 be extended beyond Erie, Pa., to Detroit and that Lake Central's route 88 go beyond Youngstown, O., to Erie and Buffalo. Awards would be for five years.

• **CAB proposed** the same service mail rates for four certificated cargo lines as are in effect for the scheduled airline industry. Covered would be Slick, Flying Tigers, Riddle and AAXICO, recently granted air mail rights on a one-year experimental basis.

• **Japan Air Lines** ordered four Douglas DC-7Cs for delivery between December, 1957, and April, 1958. Company also has four DC-8s on order.

Bendix

Builds a Better Cable Clamp—the

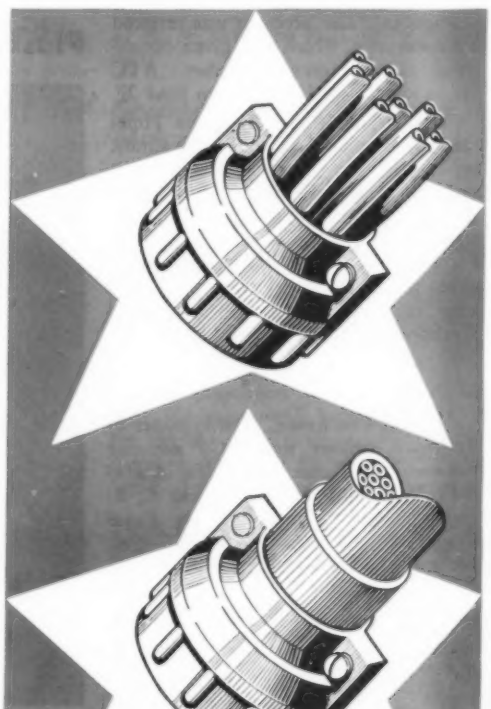
AN3057B

Inexpensive, Efficient, Versatile

The new Bendix AN approved AN3057B cable clamp is now available. Engineered by Bendix to the highest-quality standards, this cable clamp offers major design improvements. The clamping action is radial and completely eliminates wire strain and chafing by holding the wire bundle firmly in rubber. This clamp will accommodate a wide range of wire bundle sizes, but an even greater range can be handled through the use of the Bendix AN3420A accessory telescoping sleeve.

The new AN3057B cable clamp will also waterproof multiconductor rubber-covered cable on the rear of a connector, or where moisture-proof entrance through a bulkhead or into an equipment box is required.

Complete detailed information is available on request.



Bendix SCINTILLA DIVISION OF Bendix AVIATION CORPORATION
SIDNEY, NEW YORK

Circle No. 29 on Reader Service Card.

Aviation: Engineers' Golden Opportunity

Even inexperienced graduates command $400 monthly or better; jobs open in every section of country; 'fringe' benefits numerous.

Next month somewhere between 3,000 and 6,000 of the estimated 30,000 engineers graduating from U.S. colleges and universities will be setting their sights on the aviation industry for a career. And all things considered—income, job security, choice of job location—the attraction has never been greater.

Starting salaries are at an all-time high. In most instances they run $400 a month or better, even for engineers with no previous experience. Employe benefits such as bonus plans, retirement pension programs, advanced education privileges have improved to new levels.

And with its far-flung operations, the aviation industry can offer the graduating engineer a job in just about any area in the U.S. The struggle to maintain weapons superiority over the Soviets, now focused on aircraft and missile developments, leaves no major area of the country without mushrooming aircraft development and production facilities.

• **Take, for example,** the west coast. From the Pacific northwest to southern California, there are the plants of Boeing, North American, Douglas, Lockheed, Northrop, Convair and Hughes. Surrounding these major producers are such equipment and accessory firms as AiResearch, Solar, Ryan and Hydro-Aire, on a list far too long to mention.

Shifting to the midwest, in Wichita, Kan., are Boeing, Beech and Cessna. There's McDonnell in St. Louis, Douglas in Tulsa, and Convair, Chance Vought, Bell and Temco in Texas.

In the east it's Pratt & Whitney, Sikorsky, Doman, Kaman and Lycoming in New England. In the New York area are Curtiss-Wright, Republic, Grumman and Fairchild; there's Vertol near Philadelphia, Martin in Baltimore, and Fairchild in Hagerstown, Md. To the south, it's Lockheed at Marietta, Ga. and all the earmarks of an expanding aviation activity in Florida.

• **Filling any geographic gaps** are General Electric in Cincinnati, Westinghouse in Kansas City, General Motors' Allison Div. in Indianapolis, Ford in Chicago and Bell Aircraft in Buffalo.

Again, such equipment firms as Bendix, Sperry, Minneapolis-Honeywell, Vickers, Lear and Jack & Heintz, many with multiple installations, combine to virtually blanket the U.S. map with aircraft engineering activity.

And in almost every instance, these firms and many not mentioned are hard-pressed by the engineering shortage.

(*Continued on Page* 94)

Why More Engineers?

"In this race for brainpower and technological leadership, the Soviets are undoubtedly challenging our technical and scientific domination," says U.S. Air Force's Lt. Gen. Thomas S. Power, commander of the Air Research and Development Command.

How does the U.S. compare with Russia in emphasis on technical training? From 1940 to 1948, Gen. Power says, engineer training in both countries was on a fairly even keel. We forged ahead in 1950 with an all-time high turnout of 50,000 engineers, but this has dropped off year by year since then to a low of 20,000 last year.

At the same time, the training of engineers in the Soviet Union has gone in the opposite direction. In 1950 Russia graduated 28,000 engineers and the increase in the last four years has been phenomenal. They graduated 40,000 in 1953 and 54,000 in 1954!

In line with other aspects of their overall strategy, adds the ARDC chief, the prime purpose of the Soviets in the brainpower race must be to first reach and then surpass us in the output of scientists and engineers essential for achieving technological supremacy.

"Is it unreasonable to assume, then, that they will insist on quality as well as quantity? The Soviets do not underestimate the quality of *our* science and technology.

"It becomes increasingly obvious that, in a conflict involving nations thousands of miles distant from each other, technology will supplant manpower as the measure of force. It can work for us as well as for the Soviets. It can restore and maintain military balance."

ENGINEERS

ARMA announces

INERTIAL NAVIGATION

development program for an advanced Air Force missile

Inertial Navigation offers the most advanced concept in guidance, requiring no terrestrial source of energy or information, no earth-bound direction once the ultimate destination is selected. It offers the most promising solution of the guidance problem for the long-range missile.

While the principles are simple, the realization involves advanced creative engineering. ARMA's many successes in the creation of precision instruments and systems for navigation and fire control, especially precision gyroscopic reference systems for all applications, fit it uniquely for a major role in this advanced area.

The height of imaginative resourcefulness and engineering skill are required to create the degree of precision—hitherto unattained—in the components essential to the guidance of advanced missile systems—the gyros, accelerometers, and computer elements. Miniaturization must be coupled with extraordinary ability to provide utmost accuracy under conditions of extreme velocities, temperatures, and accelerations.

There's significant scientific progress to be achieved at this leadership company and individual renown to be won, by engineers associated with ARMA's Inertial Navigation Program. Many supplementary benefits make a career here doubly attractive. ARMA engineers are currently working a 48 hour week at premium rates to meet a critical demand in the Defense Dept's missile program. Moving allowances arranged.

Salary — up to $15,000
(Commensurate with experience)

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Transformers
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ARMA

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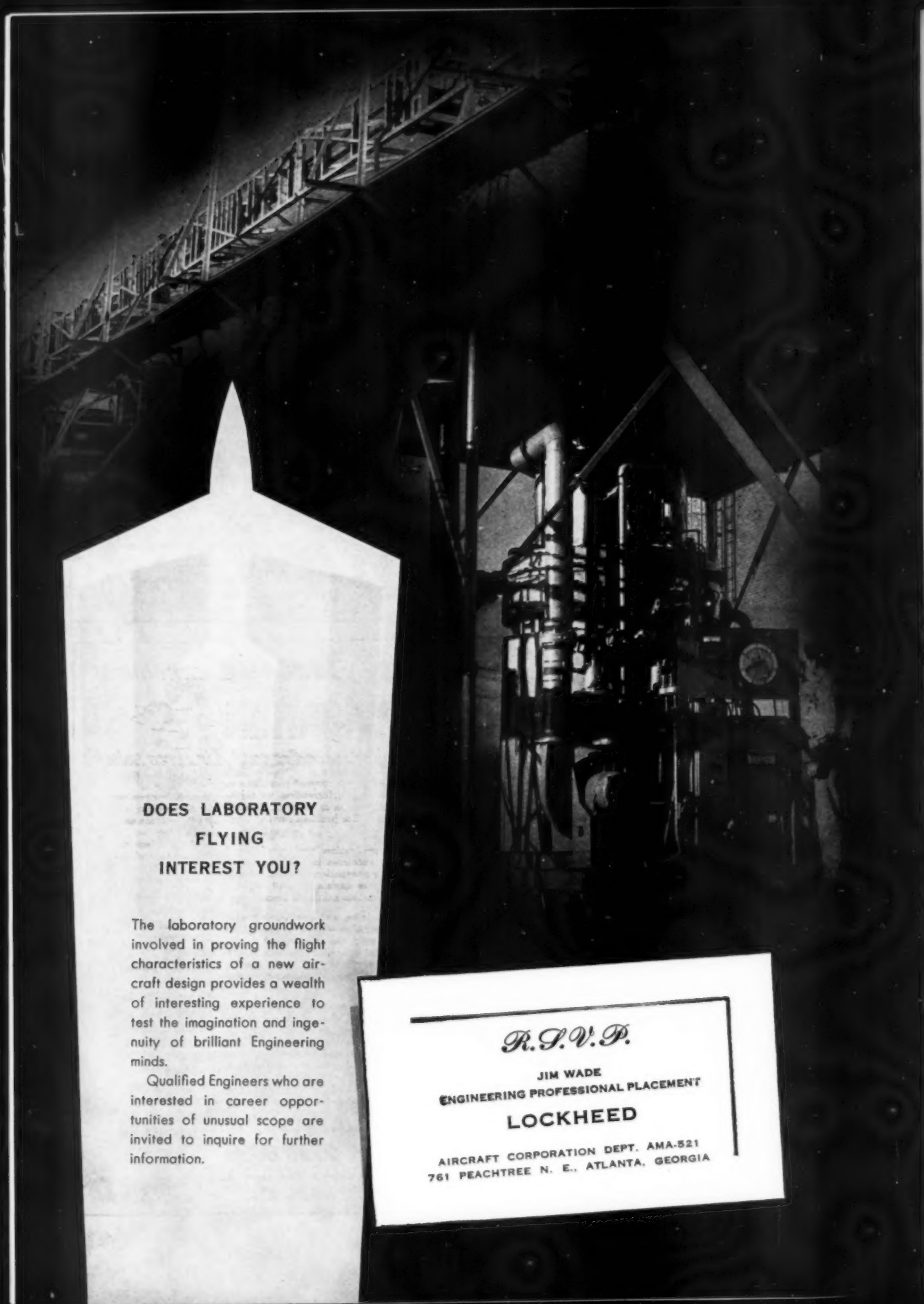

DOES LABORATORY FLYING INTEREST YOU?

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Engineering Personnel Office
Department 56AA
North American Aviation
LOS ANGELES 45, CALIFORNIA

NAVY AIRCRAFT ENGINEERING

Like the FJ-4 FURY JET

Contact: Mr. J. H. Papin
Engineering Personnel Office
Department 56AA
North American Aviation
COLUMBUS 16, OHIO

MISSILE ENGINEERING

Like the SM-64 NAVAHO

Contact: Mr. R. L. Cunningham
Missile Engineering Personnel
Office Department 91-20AA
North American Aviation
DOWNEY, CALIFORNIA

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Rocketdyne Engineering Personnel
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6633 Canoga Avenue
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A Division of North American Aviation, Inc.

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Autonetics Engineering Personnel
Office Department 991-20AA
P. O. Box AN
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- Aerodynamicists
- Thermodynamicists
- Dynamicists
- Stress Engineers
- Structural Test Engrs.
- Flight Test Engineers
- Electrical & Electronic Engineers
- Power Plant Engineers
- Research & Development Engineers
- Weights Engineers
- Environmental Test Engrs.
- Instrumentation Engineers
- Fire Control Systems Engrs.
- Flight Control Systems Engineers
- Computer Application Engrs.
- Automatic Controls Engrs.
- Inertial Instrument Development Engineers
- Preliminary Analysis & Design Engineers
- Systems Engineers
- Armament Engineers
- Servomechanism Engineers
- Weight Control Engineers
- Aero-Thermodynamicists
- Aeroelasticity Engrs.
- Mechanical Engineers
- Structures Engineers
- Controls Engineers
- Rubber Compounding Engrs.
- Civil Engineers
- Design & Development Engrs.
- Test Engineers
- Equipment Design Engrs.
- Engine Systems Engrs.
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- Hydraulic, Pneumatic & Servo Engineers
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Applicants with BSME or AE plus 3 or more years experience are preferred. Inquire *now* for responsible positions in our rapidly expanding programs in gas turbines and airborne controls. Replies will be kept confidential. Write, giving resume, to *DALE A. COBB*, Department A-130.

SOLAR

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Employment

(*Continued from page* 91)

• **On the Pacific Coast alone,** advertising officials estimate aviation companies are spending $250,000 monthly in newspaper help-wanted advertising—$3,000,000 a year! Midwest and east coast companies attempting to attract engineers by a change in scenery are major contributors.

And despite all efforts to curtail waste of this technical know-how, engineer openings are at an all-time high. Needs of firms range anywhere from 100 to 600. In June, four aeronautical engineering graduates from California's Stanford University will have their pick of 400 jobs, as one industry executive sees it.

So strong is the competition for new talent that some companies figure it now costs $2,000 just to hire a new engineer. This jumps to $5,000 if you hire him from the opposite coast.

One west coast aircraft official recently paid $48,000 for a plot of nearby real estate big enough to park only 20 cars. Why? So he could offer the space to applicant engineers as an inducement to shift from employers not offering such advantages.

And the shortage shows no signs of lessening. In recent appropriations testimony, Asst. Defense Secretary (R&D) Dr. C. C. Furnas ventured the guess that it will prevail for some time to come—perhaps 10 years.

As an immediate relief, he urged Congress to pass legislation that would improve the quality of available engineering talent. This, he suggested, could be done by allowing budgetary cost recognition in Defense R&D contracts to monies spent by firms to support advanced education of engineers.

• **Dr. Furnas' predictions** are borne out by officials of the Department of Health, Education and Welfare. Although this year's estimate of 30,000 graduate engineers represents a 7,000 increase over 1954, it is still 10,000 shy of the 40,000 that manpower experts figure are needed to meet overall U.S. industry demands.

Based on current enrollments, some 34,000 engineers will graduate in 1957, 37,000 in 1958 and 41,000 in 1959. It won't be until 1965 that the U.S. will return to the level of 53,000 engineers graduated in 1950, at the present rate.

And by that time, it's a good guess that the demand for engineers will be well past the present 40,000-a-year mark. Since aviation at best can only expect to corner between 10 and 20% of the graduates, although its needs are increasing almost commensurately with the speeds of flight, there's no guarantee that the shortage 10 years hence won't be worse than it is now. ◈◈◈

This is a partial list of Lear products. It shows at a glance why Lear offers exceptional opportunities to the ambitious engineer, fledgling or veteran. The great variety of Lear projects —plus a constant, soundly-programmed expansion of *new* developments—assure you of plenty of room to grow in, as well as ample rewards at the very start of your career with Lear.

Engineers...look before you leap!

δ *flight control systems*

Automatic altitude controllers
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Automatic Mach number controllers
Automatic pilots (lightplane)
Automatic pilots (high-performance)
Automatic pitch, yaw, and roll dampers
Automatic rudder controllers
Automatic wing flap systems
Missile control systems
Test equipment

σ *flight reference systems*

No-gimbal-lock vertical gyro indicators
Stable platforms
Test equipment
Three-axis gyro indicators
Vertical gyro indicators

γ *navigational systems*

Automatic radio direction finders
Glide slope receivers
High-latitude gyro compass systems
Integrated ADF-magnetic compass systems
Localizer receivers
Marker beacon receivers
VHF Omnirange receivers

ξ *electro-mechanical systems*

Artificial feel systems
Camera positioners
Canopy control systems
Carburetor air door controllers
Cowl flap positioners
Convertiplane rotor positioning systems
De-icing valve positioners
Engine throttle controllers
Gas, hydraulic, fuel, valve positioners
Inlet screen retraction systems
Inlet vane angle controllers
Jettison systems
Landing gear lock systems
Mechanical advantage ratio changers
Oil cooler flap controllers
Parachute door systems
Precision remote positioning systems
Supercharger blower shifters
Test equipment
Throttle friction controllers
Trim tab positioners
Turbo-prop clutch valve controllers
Wing flap positioning systems

λ *electro-mechanical components*

Linear actuators
Rotary actuators
Servo actuators
Power units
Actuator controls
Alternators
Capstans
Freewheeling clutches
Friction clutches
Magnetic clutches
Slip overload clutches
Electromagnetic brakes
Flex drive u's, hex's, L's, and T's
Flexible shafts
Gearboxes
Handcranks
Motors (AC and DC)
Enclosed fan motors
Explosion proof motors
Gearhead motors
High frequency motors
High temperature motors
Miniature motors
Pneumatic motors
Servo motors
Torque motors
Screwjacks
Load limit switches
Position limit switches
Programming switches

ζ *instruments*

ADF indicators
Attitude indicators, 2-axis
Attitude indicators, 3-axis
Directional indicators
ILS indicators
Integrated ADF-magnetic indicators
Trim indicators
Tuning meters
Omnirange indicators

μ *instrument components*

Altitude transducers
Vacuum tube amplifiers
Magnetic amplifiers
Printed and etched circuit amplifiers
Transistor amplifiers
Displacement gyros
Dynamic pressure transducers
Gravity-sensing switches
Magnetic modulators
Magnetic powder clutches
AC and DC servo motors
Electric gyro motors
Flag motors
High-frequency motors
Torque motors
Power converters
Rate generators
Rate gyros
Resolvers
Synchros
Synchro repeaters

ψ *communications systems*

UHF, VHF, HF, MF, and LF receivers
VHF transceivers
VHF, HF, and MF transmitters
ADF receivers
Airport traffic transceivers
Monitoring transceivers
Portable transceivers
Telemetering receivers
Test equipment

ε *communications components*

Audio frequency amplifiers
Vacuum tube amplifiers
Magnetic amplifiers
Power amplifiers
Printed and etched circuit amplifiers
Transistor amplifiers
Aircraft broadband antennas
Ground plane antennas
LF-MF whip antennas
Loop antennas
Mobile antennas
Trailing wire antennas
UHF-VHF whip antennas
VHF Omnirange antennas
Antenna fairleads
Antenna reels
Antenna tuning coils
Cable assemblies
Coil assemblies
Crystals
Dynamotors
Headsets
Loudspeakers
Amplifying loudspeakers
Noise-cancelling microphones
Radio noise filters

η *fluid handling equipment*

Absolute pressure switches
Bombsight and instrument desiccators
Canopy seal pressurizing kits
Cooling units for electronic assemblies
Dehydrators
Fuel flow dividers
Pneumatic actuators
Pressurizing control panels
Alcohol pumps
Anti-detonant injection pumps
Ballast pumps
Bilge and refueling pumps
Dry air pumps
Electric motor driven pumps
Ethylene glycol and coolant pumps
Ethylene oxide pumps
Fuel pumps
Fuel booster pumps
Fuel filter de-icer pumps
Fuel transfer pumps
Hand operated pumps
Heater fuel pumps
Hydraulic pumps
Hydraulic oil booster pumps
Hydrogen peroxide pumps
Lube oil and scavenge pumps
Multiple-element pumps
Oil transfer pumps
Scavenge pumps
Smoke pumps
Submerged fuel booster pumps
Vacuum pumps
Water pumps
Radar pressurizing kits
Air relief valves
Check valves
Hydraulic valves
Hydraulic servo valves
Pressure regulating valves

φ *test equipment*

Bench test cable assemblies
Electronic test sets
Field strength meters
Pressurizing test kits
Universal electro-mechanical test stands
Universal motor test stands

π *miscellaneous*

Airborne television installations
Airplane brake modernization kits
Auxiliary power supplies
Electronic chassis assemblies
Executive airplanes
Periscope prism selectors
Precision remote positioners
Printed circuits
Radomes
Wire harnesses

Lear has highly attractive engineering openings right now in Grand Rapids, Michigan; Santa Monica, California; Elyria, Ohio; and in Arizona. Send your technical qualifications immediately to Don Cook, 3171 South Bundy Drive, Santa Monica, California. Your letter and interview will be handled confidentially—by a Lear engineer.

LEAR

produces for the precision needs of aviation

CP-16 A

This is a model of an inlet air diffuser for turbojet engines, mounted in a supersonic wind tunnel. To assure maximum performance, the diffuser must position and maintain the proper shock wave pattern at the engine inlet. This is done by an automatic control which positions the diffuser correctly under all flight conditions. Without this Honeywell control, a supersonic aircraft might never reach design speed.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL

Wide Range of Jobs Open for Engineers Set to Graduate, Says Republic Official

By ROBERT L. BORTNER

Assistant Chief Engineer-Administration
Republic Aviation Corp.

Engineers graduating in June, while commanding top salaries, insurance benefits for themselves and their families, company-paid vacations and holidays, in addition to retirement plans and financial aid for further education, are given an opportunity to work on advanced engineering problems whose solutions are constantly improving the art of aircraft design and which provides for recognition of individual talent and professional growth.

The newly graduated engineer will be integrated into the industry in several ways. All aircraft companies will assign many engineers to specific positions within the organization that will permit them to begin work on problems relating to aerodynamics, structures, design, electronics, flight-testing or research assignments dealing with laboratory experiments and wind tunnel projects.

•**Many companies,** in addition to making direct assignments, have established training programs that make the transition from campus to industry much less abrupt and offer an opportunity to the young graduate to explore several areas of an organization before choosing the position in which he is most interested.

Republic offers a six-month engineering training program that provides for two assignments in technical areas and one assignment in design. When the training is completed, the engineer is assigned to the area in which he is most interested.

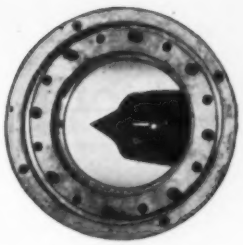
(*Continued on Page* 100)

How Aviation Pays its Top Engineers

Recent testimony of major aircraft firms before the House Armed Services subcommittee showed the following 1955 salaries figures for engineering executives in aviation.

	'55 Salary*
Boeing	
E. C. Wells, v.p.-engineering	$ 62,199
Cessna	
T. B. Salter, v.p.-engineering	37,500
Chance Vought	
R. C. Blaylock, v.p.-engineering	35,916
J. K. Clark, asst. chief engineer	24,333
H. B. Gibbons, asst. chief engr.	23,333
Convair	
R. C. Sebold, v.p.-engineering	47,500
Douglas	
A. E. Raymond, v.p.-engineering	76,113
Fairchild	
L. H. Fahnstock, director-eng.	39,082
W. Tydon, chief engineer	38,000
A. T. Gregory, chief engineer	39,923
E. W. Conlon, director-engineering	34,833
F. J. Gaffney, chief engineer	20,000
D. O. Moeller, chief engineer	33,513
Grumman	
R. L. Hall, v.p.-engineering	20,875
W. J. Hoffman, v.p.-mfg. engineering	16,178
Lockheed	
Hall L. Hibbard, v.p.-engineering	72,688
Martin	
G. S. Trimble, v.p.-engineering	10,000
McDonnell	
G. C. Covington, Jr., v.p.-engineering	53,893
Kendall Perkins, v.p.-engineering	36,244
North American	
R. H. Rice, v.p. & chief engineer	99,250
Northrop	
E. Schmued, v.p.-engineering	68,041
W. F. Ballhaus, chief engineer	41,942
T. V. Jones, deputy chief engr.	28,550
R. P. Jackson, chief anal. engr.	26,716
G. F. Douglas, asst. chief engr.	24,347
P. O. Wierk, chief adm. engr.	26,046
W. E. Woolwine, chief design engr.	20,618
Republic	
A. Kartveli, v.p.-engineering	56,053
United Aircraft	
L. S. Hobbs, v.p.-engineering	140,400

* *Includes salary, bonus or other incentive compensation.*



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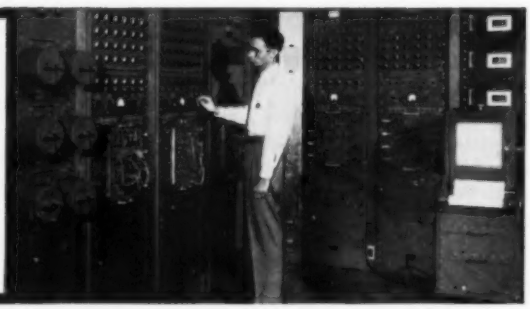

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Employment

(*Continued from Page 97*)

• **Republic also offers** a one-year program which consists of three four-month assignments in engineering, manufacturing and staff departments. The training consists of rotating, on-the-job assignments supplemented by lectures given by department heads and first-line supervisors and covers all phases of the engineering, manufacturing and staff operations. Upon completion of the year's training, each engineer is given a choice of assignment in any of the departments within the corporation for which he is qualified.

The aircraft companies, in addition to offering challenging work assignments and formal training programs, have also invested millions of dollars in expanding research facilities and modernizing equipment. Republic for example, is investing $12 million in an expansion program of its research facilities during 1955 and 1956.

Not only does the June graduate have numerous opportunities to select the job of his choice, but he can choose the location he desires and still have unlimited opportunities for advancement and professional recognition in the aircraft industry. ◈◈◈

Money Not Always Main Criterion for Student Engineers

While starting salaries for engineers are continuing to advance from the $400-$450 per month in January for students with bachelor degrees, money is not necessarily the main criterion from the student's standpoint, according to one authority.

John D. Ryder, dean of engineering at Michigan State College, told the 1956 Electronic Components Symposium in Washington that a survey taken among students at that school showed the seniors were more interested in the kind of work being offered.

Here's the breakdown: 27.7% wanted to become development engineers; 19% design engineers; 13.3% were interested in applied research, and 12% in testing. Teaching was far down the line.

Ryder offered some advice to companies regarding relations between schools and their interviewing representatives:

Companies always must let a school know in advance they wish to interview prospective engineers. He pointed out that this not always is done and causes confusion and irritation.

Employment

Pointing to the extent of feverish hiring activity, Ryder told the symposium that once 49 interviewers were at the college to interview approximately the same number of students. Over a period of several months there have been 600 interviewers talk to 200 available prospects. Requests to visit the campus are received from eight to 10 companies daily. One company offered to fly a whole class 500 miles for interviews.

One of the best ways to get the right man in the right place, from the standpoint of both the student and company, is to offer summer employment to the prospective engineer, he added.

Electronics Industry Employment Mushrooms

One out of every 40 persons employed today is in the electronics industry, and 75 percent of the jobs these people fill did not exist 10 years ago, according to H. Leslie Hoffman, President of Radio-Electronics-Television Manufacturers Association.

Hoffman, speaking before the Los Angeles Joint Student Branch of the Institute of Engineers recently, said the "going rate of electronics at the end of 1955 was over $9 billion, and is expected to reach $15 billion by 1960." Military and industrial electronics account for $6.8 billion.

The government estimates the number of electronic equipment, component and hardware manufacturers at 3,600 and, of these, 1,000 firms produce equipment and major subassemblies.

Greatest electronics growth is expected to be in the new fields of nuclear energy, solar energy, missiles, satellites, communication, navigation, rockets and countermeasures.

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ARDC Develops Short-Range Radar Trainer

A $100,000 radar trainer to teach USAF radar operators to guide their planes to a target, direct the bombing and return has been developed by Air Research and Development Command.

The trainer, which will provide operators with instruction in use of SHORAN (short-range navigation) radar, was built for ARDC by Emerson Radio and Phonograph Corp., Jersey City, N. J. It features an electro-mechanical analogue computer built jointly by Emerson, Waldorf Instrument Co. and Feedback Controls Co.

Navy Blames Control System For Sea-Master Loss

Loss of the Martin XP6M-1 Sea-Master jet flying boat in Chesapeake Bay last December has been attributed by the Navy to a "malfunction of the aircraft control system." It listed six possibilities involving failure of control cables, hydraulic systems and electrical circuits, as well as pilot error.

The Navy, which recovered 80% of the plane after three months' salvage work, said there was no evidence that fire, excess speed, abnormal aerodynamic forces, aeroelastic effects or powerplant malfunction caused the accident.

Long-Nose Convair

New long-nose modification on a Convair 340 in which a Collins Radio Co. WP101 C-band weather radar was installed. This is first installation of Collins equipment in a Convair 340. Plane is owned by Continental Oil Co. of Houston, Texas. Work was done by Garrett Corp's AiResearch Aviation Service Co.

March Procurement Hits New High - $2,118,000,000

Military procurement of aircraft, missiles, drones and related equipment in March totaled $2,118,000,000, the highest level achieved for any month of the current fiscal year, which began July 1.

The Air Force accounted for $1,901,000,000 of the total, bringing its cumulative obligations for aircraft and related items to $3,556,000,000 during the first nine months of fiscal 1957. The Navy placed $217,000,000 in March orders for a cumulative total of $1,281,000,000 for the fiscal year through March.

The two services spent $563 million for aircraft and related items in March, including $397 million by the Air Force and $166 million by the Navy. Cumulative outlays for these items over the first three quarters of the fiscal year totaled $5,648,000,000, including $4,378,000,000 by the AF and $1,270,000,000 by the Navy.

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A Few Hours with Alexandra — Then She Vanished into the Soviet Haze

During my week in Moscow I had three girl interpreters assigned to me by Intourist at one time or another. Of the three, Alexandra was by far the best and she escorted me on three rather extensive tours.

Alexandra was enthusiastic about her job. She was proud of her work, the sights, and her country. She spoke excellent English learned in an Institute. She was no glamorous beauty but she wasn't unattractive. She was a fast walker. She reminded me of a gal (the "wholesome type") who got nothing but top grades in school and was not likely to get deflected by such trivialities as sororities, dances and other frivolities. She had ample female accessories which even Soviet austerity couldn't hide. I guessed her age to be about 28. Her head was filled with a lot more facts and figures and idealogical information than her more light-headed American female counterpart is likely ever to be.

I first set eyes on Alexandra in the Intourist office in the National Hotel. I had arrived a few minutes early. When she entered I had a feeling that this rosey-cheeked girl in a red wool and fur-trimmed coat, better dressed than most Russian women, was to be my guide. I was right.

Athletic Type

Our first tour was to the Metro, or subway, which has long been a showcase of Moscow because of the marble, chandelier lights, mosaics, sculpture and the like. We left the National and walked a couple of blocks at fast pace—I recommend Alexandra for anyone who wants to exercise—and entered one of the large downtown stations.

Alexandra told me the subway is now forty miles long and being extended, and that two and a half million passengers use it daily. It's quite busy and apparently well-operated. It is much cleaner, but not nearly as extensive or busy, as New York's rapid transit systems. Alexandra seemed to notice that I wasn't reacting with "ohs" and "ahs" as many do when they see the Moscow subway. I kept thinking that the next station would be better and that I hadn't yet seen the best. But they were all the same.

So I started kidding her. I said that up in Leningrad we had a far better subway and that Moscow's was a disappointment. I referred to myself as a Leningrader. At one station where the marble only lined the walls partly I assured her that in Leningrad we had marble all over, top, bottom and all sides.

At first Alexandra didn't know how to take this kidding. Russians, as a rule, have no sense of humor. But since I was comparing Leningrad with Moscow, rather than New York or some other place, she began to react with considerable amusement. The truth is that Leningrad's new (but smaller) subway is far more brilliant and ornate than Moscow's. Just why the Russians put so much effort and pride in a subway I'll never know, but there it is. You ain't been to Moscow until you let them show off the subway. Anyway it's a superb place in which to watch all manner of Russians at close range.

We discussed tourists and I said it would be a fine idea to exchange tourists between the two countries. A lot of Russians would get quite a shock at seeing New York, I said. Alexandra looked at me but didn't react to that one.

I said I found it difficult to eat as a tourist in Russia. She pointed out that I had a choice of the three Intourist hotels. She said there were other restaurants available but I commented that they cost a great deal. I mentioned that in Paris there were over 3,000 eating places listed in the telephone book alone and that in the New York area I would assume there must be 6,000 or 7,000. Probably she didn't believe me.

Returning to the hotel we passed a gang of old women shoveling snow off the sidewalks. I said I couldn't get over seeing the way women have to work in the streets. Alexandra gave an offhand laugh as if fully prepared for my comment and said that all foreigners comment on that but she herself wished she could do that kind of work, like cleaning off the sidewalks. "I get such a good feeling keeping things cleaned up," she said. So that was the official answer. There is joy in work. The old women shoveling snow hour after hour in the bitter cold—including an all-night shift—were supposed to enjoy it as an exalted, dedicated activity.

Tour of Kremlin Fascinating

My next encounter with Alexandra came when I visited the Kremlin. When she appeared at the office I felt like I was meeting an old friend. She was really a very good guide and I got the impression she welcomed exposure to westerners.

We walked (fast) about a half mile to the south entrance. It was bitter cold. About 10,000 people a day go through the public portions of the Kremlin and already, as we reached the gate, there was a long line waiting for the opening. Alexandra being from Intourist, we passed right on through and entered the main museum before the official opening.

The Kremlin is a collection of churches (all museums now), palaces and government buildings situated on a bluff overlooking the river and surrounded by high walls and towers. Stalin lived inside the Kremlin compound but today's bigshots have elected to live elsewhere. It is only in the past few years that the public has had a chance to see inside those walls. By all means if you go to Moscow, take the complete Kremlin tour. And go with an Intourist guide, otherwise you join a big organized group and you can't understand the language anyway.

The Kremlin museum is a tremendously rich collection. It includes endless gifts from foreign potentates to the czars of old. You'll go far before you see in one place so many decorative objects filled with real diamonds, emeralds, saphires and other precious stones. It's fabulous. Then there is a magnificent sword collection, and coronation robes and costumes, and a fine collection of royal carriages and sleighs, thrones, and the like. It is well-organized and well-maintained.

Fiercely Proud of Collection

Alexandra knew every single item in the museum and the story about each. Since I have visited many parts of the world I made comparisons with other things I had seen elsewhere. She seemed to relish the exchange of information. But it was clear she was fiercely proud of this collection. Yet every single item in it was pre-revolutionary. It was Old Russia. Or Mother Russia. I noted the intense interest shown by the Russians who were touring the place. All exuded admiration for something they considered to be Russian; it was theirs. It brought

W. W. P. on Red Square with city bus and St. Basil's in background. Photo by Lennart Rehnqvist of SAS.

back memories or history from the days of the rich czars. I wondered what they really thought.

From the museum we walked along the embankment to the collection of odd-looking churches and cathedrals which had been built in the days of the czars. They are all being opened as museums now, a few very recently. In them are priceless collections of old Greek Orthodox church art, icons, murals and religious ornaments.

Another tour with Alexandra took us, this time by car, to the Russian art museum, mostly paintings. Since I had seen almost no Russian art in western Europe, I was curious. The truth is that Russia has never produced any great artists and the paintings are really a chronological picture story of Russia itself. I found it intensely interesting. Alexandra knew every painting in the scores of galleries. I said several times that I wanted to be sure and see the modern stuff and she said I would, at the end, but she didn't think it was so good and didn't think it would interest me.

She was right. The post-revolutionary stuff is not only chiefly propaganda, but it is of very poor quality. Lenin and Stalin are postered all over the place. This museum isn't a "must" for tourists, but I found it engaging in the way it portrayed people and scenes through the centuries before Communism. Such a collection can only be seen in Moscow. Here again I felt that Alexandra's chief personal interest was Old Russia, not the new propaganda stuff.

Revolution vs. Evolution

For several days I had wanted to ask a sarcastic question. I decided to try it out on Alexandra to see what she would say. I said, "Ever since arriving in Russia I've been wondering what ever happened to the *people's* revolution," and I added that nobody in the west can understand why Russia lags so far behind in everything and the people have so little.

If you have any idea about the smugness of the Russians (equal in intensity to the equally irritating egocentricity of Americans), you will understand that these questions comprised a needle stuck in awfully deep. I waited anxiously for the reaction and reply. She seemed a little taken aback but then out came her answers.

Her first answer was that the Russian people had removed illiteracy, which she considered to be a great achievement because the people knew nothing at all before the revolution in 1917. Next she mentioned the five-year war which had devastated a large part of the country. (I broke in to say a lot of other countries were in that war, too, and all recovered quickly). Third, she mentioned social welfare things like medical care, pensions, vacations, and the like. All in all, she thought Russia had made a great deal of progress.

I agreed it had made progress but pretty slow progress. I said it looked to me as though there was too much bureaucracy and too much waste of valuable manpower in inefficient methods and administration. I said the rest of the world had changed but Russia hadn't. I said you people had a revolution but the rest of the world has had evolution. I said Marx was partly right when he wrote his original thesis but that today there is no such thing as the capitalism which Marx wrote about. I said a man who pays 85% of his income in taxes isn't exactly an old-fashioned capitalist.

My notes of this repartée are not complete but I did write down afterwards that she had replied at one point that she found Marx very dull and very difficult to read. I regret to say that I failed to ask her if she were a member of the Communist Party (only 7 million out of 200 million are party members). I suspect not, although she had been accepted by Intourist as a capable guide, which she is. At no time did she make any jibes at the U.S. or the west. Her main apparent objective was to make me like Russia as she obviously liked it, with emphasis on the old traditions and history and the present struggling for betterment. On my part I found the Kremlin and the art museum of genuine interest.

The only reasonably new American car in Moscow, a powder blue 1954 or 1955 Ford owned by a Canadian diplomat, was parked in front of the National Hotel when we passed by. Alexandra commented favorably on it. I told her it was one of our cheapest cars, that everybody in America owns cars and that the Ford was one of the most common, and production of all cars in 1955 would exceed 5 million. When I gave that figure she asked me to repeat it, to make sure she understood what I had said. (Actually I was a couple of million cars too low as it turned out). I said my secretary owned a new car like the Ford. She said if everybody has cars, the streets must be so filled that they are of no use. I tried to explain that we do have traffic problems but we're continually building new streets and highways. But the gulf between our two worlds was too great; she couldn't comprehend the existence of so many cars.

At one point Alexandra commented that something must be wrong with the Soviet chemical industry because it turns out so few colors for fabrics and women's clothes. I have been told by those who know Russia well that it is exceedingly rare when any Russian, especially one in an official or semi-official position, criticizes anything in their own country to a foreigner. Alexandra was right, of course, and perhaps she is an example of growing and more open criticism of the lagging Russian consumer goods industries.

All in all, I found Alexandra an interesting person. Although very serious, she believed in her country (or wanted to). As we looked at paintings and other things I would mention that I had been to places pictured such as Venice, Paris, India, China, South America. I seemed to get the idea that she would like to see a lot of the world, herself.

While talking about the exorbitant prices tourists have to pay in Russia, I said I wanted very much to buy one of the very fine lacquered boxes for which Russia is famous, but that the prices (ranging up to $1,000 at official rate of exchange) were out of the question. But, Alexandra said, there are boxes at all prices. "I have a small one at home for my jewels—but, of course, I have no jewels," and she laughed. The remark was completely spontaneous. There was that abrupt break, then the change in pace to a laughing admission that she had no jewels. What did it signify? I wonder.

When Words Fail

On the way back to the hotel from the last tour I was to have with Alexandra I asked her if she was married. She said yes. I said her husband was a lucky man. She asked why I said that. I said because I thought she was quite a nice girl. "How can you know that just from words?" she replied. She had me there. It was obvious that Alexandra wasn't falling for such malarkey.

Evidently she has more thorough tests of evaluation than conversation in mind. As for those, they are not tests available to foreigners. I had enjoyed talking back and forth with Alexandra, but the curtain rang down when the tour ended. There is no greater segregation in the world than that achieved by Russia between its 200 millions and the visitor from abroad. After three brief exposures to a foreigner Alexandra vanished into that strange and inpenetrable world known as Soviet Russia. I wonder which one of us had the greater effect on the other. I'll never know but I think I planted a few provocative ideas and questions about a far more interesting world she has never known.

View of Red Square showing Lenin-Stalin mausoleum at center right, Kremlin on right, St. Basil's in rear and Gum department store on left. USSR photo.

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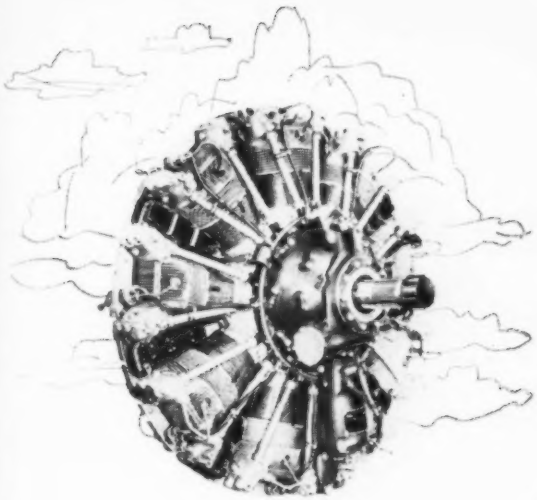

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